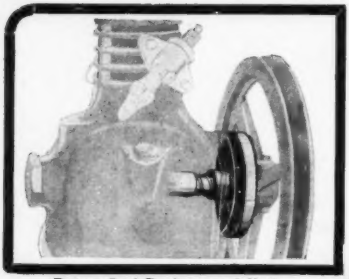
The Refrigeration Service Engineer

MAY • 1936

Graphic Selector for Estimating Leads • Questions and Answers • The Small Commercial Condensing Unit • New Appliances



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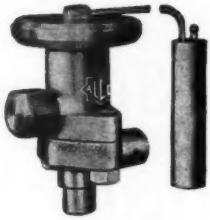

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The REFRIGERATION SERVICE ENGINEER

Devoted to the Servicing of

REFRIGERATION UNITS *and* OIL BURNERS

VOL. 4 MAY, 1936 NO. 5

COVER

THE best assurance against vibration and noise in a motor is the perfect balance of the rotor. On the front cover is a worker statically balancing a motor rotor on parallel ways in the plant of the Ohio Electric Mfg. Company in Cleveland. No machine yet devised can balance small rotors as perfectly as a skilled worker using these level parallels. Rotors are so uniform in construction and intrinsically nearly in balance that dynamic balancing machines cannot improve on this static balancing operation.

Photo: N. B. Auker-man — Courtesy: The Ohio Electric Mfg. Co., Cleveland

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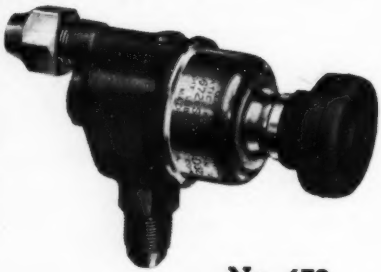
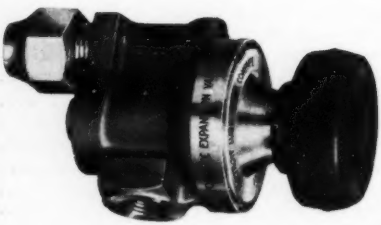
• SIMPLE
• EFFICIENT
• ECONOMICAL

AUTOMATIC EXPANSION VALVES



No. 672



No. 676

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The Refrigeration Service Engineer

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OFFICIAL ORGAN REFRIGERATION SERVICE ENGINEERS' SOCIETY

VOL. 4, NO. 5 CHICAGO, MAY, 1936 $2.00 per Annum

Household Service

Diagnosing Trouble and Servicing Household Machines

Customers Complaints May or May Not Indicate Source of Trouble. Here Are Systematically Outlined the Majority of Complaints Received and Their Remedies.

By GEORGE CLARK, B.S.M.E.*

IN servicing any refrigerating system, the service man is usually guided first by the complaint he gets from the customer when the service call is received; second, he may have a more detailed report of the trouble when he arrives at the customer's premises; third, he proceeds to install the gages in such systems as may be provided for gage connections and then he proceeds to analyze the trouble, keeping in mind the customer's report and the conditions he finds.

Experience teaches us that the customer's report of how a refrigerator acts may not always be accurate; it may be based largely on an opinion with some foundation. For instance, a customer may have a remote installation with the condensing unit of the refrigerating system installed in the basement. The customer happens to be in the basement and the machine is running; he may then go to another part of the house and on returning to the basement again he finds the machine is running. After doing this possibly three or four times, he becomes convinced that the machine is running constantly and he reports to the service man that the machine runs continuously. It may be, however, that when the customer is not in the basement the machine stopped, had an off period, and started again before the customer returned to its vicinity, so that it is very easy to be misled, especially in connection with a device such as a refrigerating machine with which a customer has become more or less familiar and may not notice particularly if the machine does stop and start again. However, the customer's complaint on the refrigerator is often one of the important leads we have to work with.

In some cases we may be called on a service job and we may find the machine operating perfectly from outward appearances and

* Detroit School of Refrigeration. Chairman National Educational and Examining Board R.S.E.S.

perhaps the machine is operating perfectly when the service man is on the job; however, it may be that the machine was not operating at some time before the service man got there and if so, it is quite probable that the machine may not operate properly at some other time after he leaves. There are some types of troubles which appear periodically in a machine. The customer's description of the way the machine acts then may lead us to determine which one of these types of service troubles may occur in the machine and we can proceed to make whatever correction may be necessary.

Probably the best way of describing a method of analyzing service troubles consists in stating the complaint received on the refrigerator, stating the causes which might lead to the conditions stated and then suggesting the remedy to be used in making the necessary repairs.

Of the five types of pressure reducing devices a particular symptom may indicate a different trouble so that it will be necessary to state what type of system they are referring to in diagnosing a trouble from a particular indication. Several types of trouble are common to all types of refrigerating systems and where a trouble is common to any type of system, the type of system need not be specified.

SERVICE CALL NO. 1

Complaint: The Refrigerator Does Not Operate

Cause A. Power line dead.

Remedy: Check line.

Cause B. A burned-out fuse, or overload cut-out open.

Remedy: Replace fuse or reset overload cut-out and check refrigerator to see what caused overload. Overload may have been caused by excessive load on compressor, by dry compressor bearings, by dry motor bearings, or other motor trouble.

Cause C. The motor may not be operating properly, a partial ground or short in the motor winding may cause excess current requirements.

Remedy: The motor may be tested by slipping the belt from the compressor, trying the motor unloaded to see if it operates properly. Then start it with a load on the motor which may be done by using the belt as a brake on the motor pulley. Common motor troubles include short brushes in connection with repulsion induction type motor and dirty or burned contacts in the short circuiting device (in repulsion induction motors) and a dirty or oily commutator on the same type motor. The brushes used in starting the motor may also be set improperly which will cause a high starting current and perhaps will not allow the motor to come up to full speed.

Make necessary repairs or replace motor and have motor repaired by a competent motor repair shop.

Cause D. Control switch not closed. A vapor pressure operated control which has lost its charge remains open.

Remedy: Replace control, if control is temperature operated. If the control is a pressure control, indications are that the refrigerating system has lost its charge or that insufficient pressure is built up to close the switch, or the line which goes to the pressure control may be closed or plugged so that the pressure does not go up in the control as it does in the rest of the system and thereby may leave the switch open.

Check system for refrigerant, refrigerant leaks, also check control for adjustment and for effective contact at switch points.

SERVICE CALL NO. 2

Machine Short Cycles

Causes applying to both temperature and pressure control operated machines.

Cause A. Excess refrigerant in high side float systems and capillary tube systems.

Remedy: Remove excess refrigerant.

Cause B. Leaky pressure reducing valve in a case of low side float valve system, high side float valve system, automatic and thermostatic expansion valve system.

Remedy: Repair or replace valve.

Cause C. Leaky compressor head valve.

Remedy: Replace or repair.

Causes applying to temperature control operated machine.

Cause D. Differential adjustment of control too low.

Remedy: Reset control.

Cause E. Thermostatic bulb of control in improper location.

Remedy: With automatic expansion valve system, thermostat bulb normally should be clamped to evaporator near suction line or on suction line near evaporator or inside of brine tank.

Cause F. Expansion valve may be set for too high suction pressure.

Remedy: Reset expansion valve.

Cause G. Expansion valve may leak refrigerant into evaporator during off period.

Remedy: Repair or replace expansion valve.

Causes applying to pressure control operated machine.

Cause H. Partially plugged screen in pressure reducing valve or partly plugged liquid line.

Remedy: Locate plug and clean out.

Cause I. Plugged suction line due to frost pinches or dirt and carbon.

Remedy: Locate plug and open.

Cause J. Low refrigerant.

Remedy: Locate leaks and recharge system.

Cause K. Pressure control improperly set; probably differential too small.

Remedy: Reset control and check setting with gages.

Cause L. Suction line too small.

Remedy: Replace with larger suction line.

Cause M. High pressure cut-out kicking out control due to high head pressure in the case of water cooled machine.

Remedy: Locate cause of high head pressure and repair. Cause may be insufficient water, air in system, improper cut-out pressure adjustment, excess liquid in system, or plugged lines.

SERVICE CALL NO. 3

Machine Operates Continuously

Cause A. Low refrigerant.

Remedy: Check for leaks and recharge.

Cause B. Excess refrigerant.

Remedy: Remove excess refrigerant.

Cause C. High head pressure. In thermostatic and automatic expansion valve and low pressure float system, this may be caused by excess refrigerant. In any system it may be caused by air or non-condensable gases in the system or it may be caused by a plugged line, usually between the compressor and the receiver.

Remedy: Purge non-condensable gases or refrigerant, locate any restrictions in line and remove.

Cause D. Low capacity may be due to bad piston valve or head valve, or these may be referred to as suction and discharge valves. The poor fit of piston in the cylinder or anything which may cause low volumetric efficiency in compressor will cause low capacity. The refrigerator may operate at normal temperature, at above normal temperature, or at sub-normal temperatures with low capacity.

Remedy: Locate cause of low capacity and repair. Check suction valve and discharge valve, also compressor speed.

Cause E. Expansion valve set too high. This will be accompanied by frost back to compressor if system has sufficient refrigerant after a long period of operation.

Remedy: Reset expansion valve or replace if defective.

Cause F. Expansion valve set too low. With sub-normal suction pressures, the capacity of the compressor is reduced.

Remedy: Reset expansion valve. Check operation. This condition may be accompanied by normal, above normal or sub-normal temperatures in the refrigerator.

Cause G. Plugged liquid line, plugged suction line or insufficient refrigerant for proper operation which may allow machine with temperature control to run continuously without producing refrigeration.

Remedy: Locate cause of little or no refrigeration and repair.

Cause H. Electrical trouble, such as contacts in the control stuck in closed position or fault in wiring.

Remedy: Locate fault and repair.

Cause I. Control lost its charge—if control is of freezing liquid type.

Remedy: Replace control.

Cause J. Moisture in refrigerant freezing at orifice of valve. Will be indicated by high suction pressure if valve is frozen open and low suction pressure if frozen closed.

Remedy: Install suitable dryer in liquid line for one day to one week.

Cause K. Moisture in outside of valve bellows. Valve may freeze in open or closed

positions. Ice does not allow bellows to move.

Remedy: Remove moisture from bellows and add glycerine.

SERVICE CALL NO. 4

Electrical Bill Too High

Cause A. Cause of high electric bill may not be due to refrigerating system at all but the refrigerating system may be blamed for the high bill.

Remedy: Check refrigeration system, see that it is operating properly and, if so, advise customer the trouble is not in the refrigerator.

Cause B. Inefficient motor. This may be due to partial ground or short in the motor or troubles inside the motor itself. It may also be caused by dry motor bearings or an overload condition on the motor.

Remedy: Check compressor to determine if the high input is due to a high compressor load or if the high input is due to an inefficient motor. If motor is inefficient, replace or have repaired.

Cause C. Motor overloaded.

Remedy: Check system to determine cause of overload. Overload may be due to:

(a) Excess refrigerant, air or non-condensable gases in system. Remove excess refrigerant or purge non-condensable gases.

(b) Restriction between compressor and receiver. Check for cause of restriction and remove restriction, replacing condenser if necessary.

(c) Insufficient oil in compressor or motor bearings. Add oil to compressor crankcase and oil motor bearings.

(d) Abnormally high suction pressure, due to thermostatic expansion valve or low side float valve letting refrigerant through at high pressure accompanied by very little refrigeration due to insufficient refrigerant in the system. Recharge system and see that temperature and pressure is being reduced properly before leaving.

(e) Abnormally high head pressure, due to insufficient cooling, or excess refrigerant. Purge excess refrigerant and non-condensable gases, clean condenser and check for restriction between compressor and receiver. Make necessary repairs. If the condensing unit is boxed in so that insufficient cooling air can reach the condenser, the remedy is to remove the unit; that is, install the condensing unit in a cooler location.

(f) High head pressure due to insufficient cooling, that may include the fan disconnected from the motor pulley or fan belts bent so as not to provide sufficient air circulation. Check fan on motor pulley to insure proper air circulation. Also check condenser for dirt or other restriction to passage of air through the condenser.

Cause D. Machine runs too much. This may include any condition mentioned under Service Call No. 3, in which machine operates continuously.

Remedy: See Service Call No. 3.

Cause E. Poor insulation in refrigerator, refrigerator located in warm location, and air leaks in refrigerator.

Remedy: Replace door gaskets to cut down air leaks and insulate refrigerator from any stoves or any other appliances which may pass considerable heat to the refrigerator. In case of poor insulation in refrigerator, replace refrigerator.

SERVICE CALL NO. 5

Suction Line Frosts Back

Causes in an Automatic Expansion Valve System

Cause A. Expansion valve metering refrigerant too fast due to improper adjustment or defective valve.

Remedy: Adjust or if valve is defective, replace.

Cause B. Defective wiring, causing the machine to run continuously when the control circuit is open.

Remedy: Locate defective wiring and repair or replace.

Cause C. Temperature control defective so that it will not turn off.

Remedy: Replace, repair or adjust control.

In a Low Side Float System

Cause D. Defective float valve, feeding refrigerant through too fast.

Remedy: Repair or replace float valve.

In a High Side Float Valve System

Cause E. Excess refrigerant or defective float valve.

Remedy: Remove excess refrigerant or replace float valve.

In a Capillary Tube System

Cause F. Excess refrigerant in the system.

Remedy: Remove excess refrigerant.

In Thermostatic Expansion Valve System

Cause G. Improper thermostatic valve adjustment or defective valve, letting refrigerant through too fast.

Remedy: Adjust valve or if valve is found defective, replace.

SERVICE CALL NO. 6

Odor Around Refrigerator

Cause A. Refrigerant leak in high side.

Remedy: Locate and repair leak. In a sulphur dioxide system use an ammonia swab to locate leaks. In methyl chloride or "Freon" system locate leaks with a leak detector torch. In other systems having a pressure greater than atmosphere on the high pressure side of the system, check for leaks with oil or soap suds around connections where leak may occur, repair leak and check system for operation. Recharge if necessary.

Cause B. Leak in low pressure side of the system.

Remedy: Locate leak by building up pressure in low pressure side of the system by warming up the evaporator or by putting a refrigerant pressure on low pressure side by means of a drum of refrigerant. Check leaks the same as in high side. In case of seal leak, remove compressor to shop and repair seal. If leak is in connections, repair faulty connection and put system in operation, recharging if necessary. If system is a sulphur dioxide system and air may have been drawn in through the low side leak, the system should be cleaned out and recharged or a suitable drier should be installed in the liquid line.

Cause C. Brine tank leaks.

Remedy: Check brine tank for leaks. If odor is denatured alcohol rather than the refrigerant used in the system, the leak is undoubtedly in the brine tank. Remove and resolder and refill or replace.

Cause D. Overheated motor due to insufficient oil in motor bearings.

Remedy: Oil motor bearings and check operation of motor to see that the temperature does not become excessive. If trouble is not in bearings, remove motor for repair, or replace.

Cause E. Food or paint odor.

Remedy: Advise customer to keep foods which easily take on flavor from other food, well covered. Any liquids in refrigerator should be kept covered. Check refrigerator to find if there may be some stale foods in the refrigerator which customer may have forgotten. If odor is due to finish in refrigerator, refrigerator should be refinished or replaced.

SERVICE CALL NO. 7

Radio Interference While Refrigerator Is Running

Cause A. In a.c. motors, this is usually caused by static electricity generated on the belt and discharging it periodically.

Remedy: Ground the motor and compressor to a waterline or other suitable ground. If motor is a d.c. motor, in addition to the above it may be necessary to put a small electrical condenser in shunt with each motor brush to ground.

SERVICE CALL NO. 8

Evaporator Sweats or Drips

Cause A. Control set for too high a cut in temperature.

Remedy: Adjust control colder on cut in.

Cause B. A slow leak in brine tank allows brine on surface of the tank which causes evaporator to defrost and drip.

Remedy: Find leak in tank and repair or replace brine tank; refill.

SERVICE CALL NO. 9

Refrigerator Too Warm or a Great Difference in Temperature Between Top and Bottom of Refrigerator

Cause A. Evaporator too heavily frosted cutting down air circulation by evaporator.

Remedy: Shut off refrigerator until completely defrosted and advise customer to defrost periodically.

Cause B. Improper circulation of air in refrigerator due to overcrowded shelves in refrigerator or in some cases, paper being placed on shelves by customer.

Remedy: Remove any shelf paper to insure free circulation and arrange food to provide space for air circulation.

SERVICE CALL NO. 10

Machine Runs and Does Not Freeze

Cause. See Service Call No. 3, "Machine Runs Continuously."

Remedy: Service Call No. 4, "Electrical Bill Is Too High."

SERVICE CALL NO. 11

Only a Part of the Evaporator Frosts

Cause A. Insufficient brine in tank.

Remedy: Repair tanks and refill or replace. Further causes may be as listed under Service Calls 3 and 4.

SERVICE CALL NO. 12

Refrigerator Will Not Freeze Desserts

Cause A. Refrigerator evaporator not as cold as it should be or the refrigerator evaporator is running at temperature above normal.

Remedy: Reset control and/or expansion valve.

Cause B. In older style brine tank systems the normal operating temperature of brine tank is above the freezing point of the dessert which the customer is attempting to freeze.

Remedy: Advise customer that extremely low temperatures in the evaporator of that style refrigerator are not possible or that if they are possible, it will cause too low a refrigerator temperature and is apt to cause freezing of foods.

SERVICE CALL NO. 13

Foods Freeze in Refrigerator

Cause A. Improper circulation of air in the refrigerator.

Remedy: See that air passages throughout refrigerator are open.

Cause B. Evaporator temperatures too low.

Remedy: Reset control for a higher temperature.

Cause C. Refrigerator location is too cold.

Remedy: Shut down refrigerator unit periodically or remove refrigerator to warmer location.

SERVICE CALL NO. 14

Refrigerator Is Noisy

Cause A. Noisy motor may be due to dry or loose bearings or defective cores in fields of armatures.

Remedy: If cause is dry bearings, oil bearings; otherwise remove motor and have it repaired by a competent motor repair shop.

Cause B. Commutator pitted or has high mica or short brushes in motor or brush squeak.

Remedy: Clean commutator, replace brushes if necessary and if this fails to remedy the conditions, remove motor and have it repaired.

Cause C. Motor pulley loose on shaft.

Remedy: Reset motor pulley on shaft by means of set screws.

Cause D. Defective motor pulley; especially flanges loose on pulleys made from stampings.

Remedy: Replace motor pulley.

Cause E. Fan loose on motor pulley.

Remedy: Resecure fan to pulley. If pulley is flanged type with fan riveted on, it may be advisable to replace pulley and fan.

Cause F. Fan striking condenser or some other parts of the condensing unit.

Remedy: Bend fan blades to clear other parts of the condensing unit.

Cause G. Belt squeak.

Remedy: Apply belt dressing to sides of belt. In some cases a rag soaked with oil my be pressed to the sides of the belt, in some cases laundry soap may be applied to the sides of the belt and temporarily remove squeak. If squeak persists or recurs, belt may be replaced with a different type of belt; that is, the cut type of belt which is particularly susceptible to squeaks may be replaced by the moulded type of belt.

Cause H. Belt slapping due to loose tabs on belt or due to layers of belt becoming separated.

Remedy: Replace belt.

Cause I. Compressor fly wheel loose on shaft or defective.

Remedy: Resecure fly wheel to shaft or replace fly wheel.

Cause J. Loose bearings in compressor.

Remedy: Remove compressor and repair in shop.

Cause K. Compressor low on oil.

Remedy: Add oil to compressor.

Cause L. Compressor piston strikes head.

Remedy: Remove compressor discharge valve and compressor head. Check piston

to see that there are no loose parts or pieces of metal on top of piston and check for clearance. If there is insufficient clearance, add another gasket between compressor cylinder and valve plate to prevent piston's striking valve plate.

Cause M. Noisy compressor valves.

Remedy: Check valves for lift. Normally piston valves may open from .010 to .015 of an inch and for normal operation a discharge valve may open from .006 to .010 of an inch.

Cause N. Parts of the condensing unit loose on base.

Remedy: Tighten motor, compressor, receiver and all other fastenings to base.

Cause O. Tubes rattling against each other or against cabinet.

Remedy: Resecure tubes with tape or rubber between tubes or between tubes and any solid object which they may strike.

Cause P. Improper mounting of condensing unit.

Remedy: Experiment with rubber or springs and mounting to secure condition where vibration from condensing unit is not transmitted to the refrigerator.

Cause Q. Gas hissing noise through pressure reducing device in refrigerator due to low refrigerant charge.

Remedy: Recharge system.

Cause R. Rattle or chattering of pressure reducing device.

Remedy: Replace or repair.

JUNE ISSUE—*Apartment House Service*

Load Computator.

Graphic Selector for Estimation of Loads

Computing load factors for the commercial job requires a little figuring to determine the proper size compressor

By L. K. WRIGHT, A.S.R.E.

THE accompanying chart provides a simple, rapid and accurate means of estimating the general run of jobs up to and including those encompassed by half-ton sizes. By means of the chart proper low side equipment and high side apparatus may be selected.

Usage Factors

The usage factors shown in the upper left hand portion of the graphic selector chart, Fig. 1, pertain to normal usages encountered in the particular fields noted. In the event of exceptionally heavy duty the estimator should make allowances and overshoot the indicated factor. The majority of jobs come under the normal factors given and these may be taken to apply in nearly all cases.

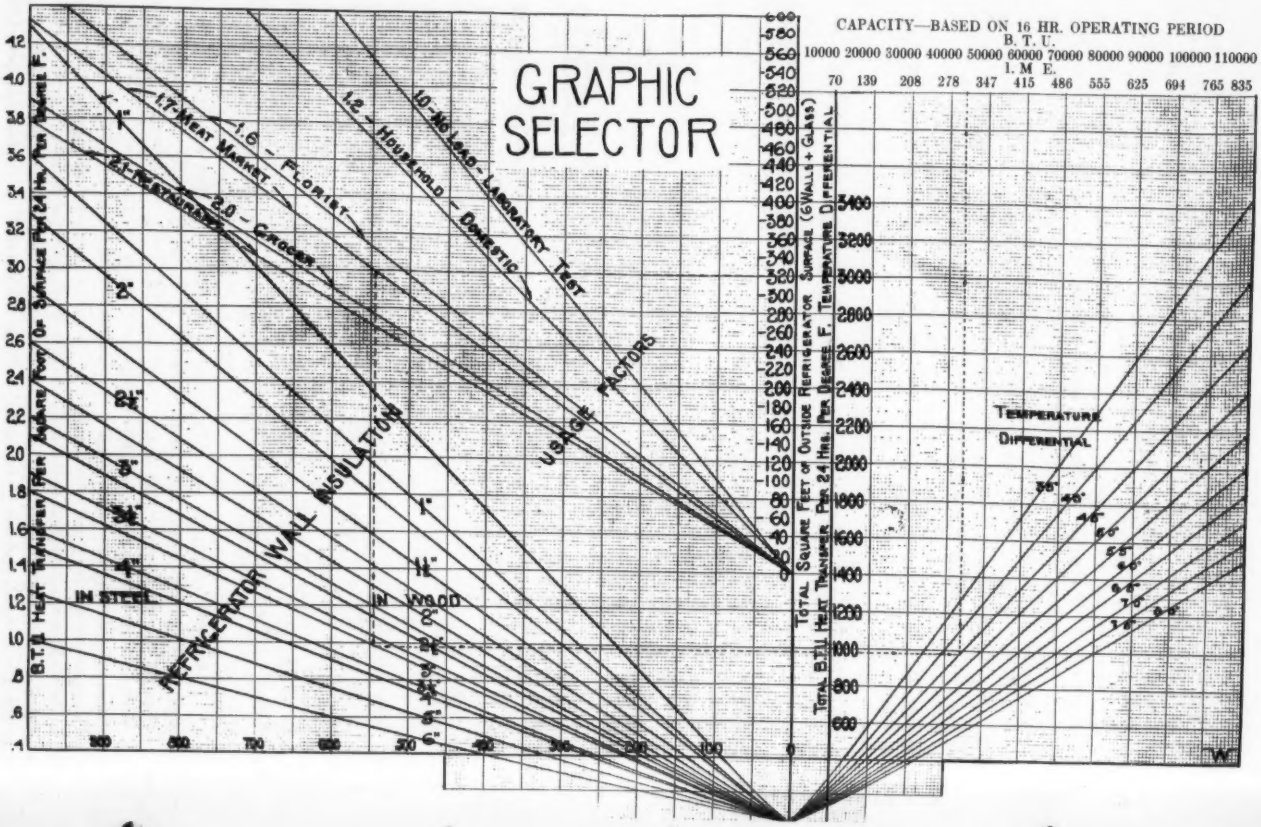
Insulation

The wall insulation factors are divided into two main groups, given at the lower left hand section on the selector chart.

The insulation is presumed to be corkboard, sheathed in steel or wood. The newer, smaller boxes are generally sheathed in steel and this listing is given at the extreme left hand section of the chart.

Corkboard sheathed in wood (usually ⅞ in. tongue and groove) is listed at the right of the steel sheathed corkboard and applies to the larger systems as a general rule.

Where insulation other than corkboard is


GRAPHIC SELECTOR
CAPACITY—BASED ON 16 HR. OPERATING PERIOD
B. T. U.
10000 20000 30000 40000 50000 60000 70000 80000 90000 100000 110000
I. M. E.
70 139 208 278 347 415 486 555 625 694 765 835
REFRIGERATOR WALL INSULATION
B.T.U. Heat Transfer per Square Foot of Surface per 24 Hrs. per Degree F.
1.7-Meat Market
1.6-Florist
2.1-Restaurant
2.0-Grocer
1.2-Household-Domestic
10-Mo. Lead-Laboratory Test
USAGE FACTORS
Total Square Feet of Outside Refrigerator Surface (6 Walls + Glass)
Total B.T.U. Heat Transfer Per 24 Hrs. Per Degree F. Temperature Differential
Temperature Differential
IN STEEL
IN WOOD

encountered the following comparative values may be used to indicate proper insulation rating.

COMPARATIVE INSULATION VALUES

Basis: Corkboard	1"	1½"	2"	3"	4"
Cabot's Quilt	1"	1½"	2"	3"	4"
Celotex	1"	1½"	2"	3"	4"
Balsam Wool	1"	1½"	2"	3"	4"
Dry Zero	1"	1½"	2"	3"	4"
Fibrofelt	1"	1½"	2"	3"	4"
Flaxlinum	1"	1½"	2"	3"	4"
Hairfelt	1"	1½"	2"	3"	4"
Insulite	1"	1½"	2"	3"	4"
Kapock	1"	1½"	2"	3"	4"
Linofelt	1"	1½"	2"	3"	4"
Masonite	1"	1½"	2"	3"	4"
Mineral Wool	1"	1½"	2"	3"	4"
Rock Cork	1"	1½"	2"	3"	4"
Rock Wool	1"	1½"	2"	3"	4"
Balsa Wood	1½"	2¼"	3"	4½"	6"
Granulated Cork	1¼"	1½"	2½"	4"	5¼"
Insulex	2"	3"	4"	6"	8"
Lithboard	1½"	2¼"	3"	4½"	6"
Saw Dust	2"	3"	4"	6"	8"

Error should be avoided by ascertaining insulation and sheathing and selecting proper leakage line.

Ambient Temperature

For the ambient or room temperature in which the refrigerator is located use the highest summer temperature.

In the extreme northern section of the United States, a summer temperature of 80° F. may be assumed, 90° F. for the middle section and 100° F. for southern locations. Along the Gulf and Mexican border it is best to assume a mean maximum of 110° F.

Refrigerator Temperature

Refrigerator temperatures vary with the product, service and length of storage. The following temperature list presents standards which give maximum food preservation with minimum operating expense. The lower the box temperature the greater the cost of maintaining the refrigerator, therefore select proper temperature for low operating lost.

Refrigerator Use	Location of Thermometer	From °F.	To °F.
Small Market	Center of rear wall	38	45
Large Market	Center of rear wall	36	42
Grocers	Small lower compartment	42	48
Restaurant Service	Small lower compartment	42	48
Restaurant Storage	Center of rear wall	38	45
Florists	Center of rear wall	48	54

A "small" market box is one having up to 300 square feet of surface. One with greater surface would be assigned to the large market listing.

Temperature Differential

The temperature differential, given at the right hand side of the chart, is the difference between refrigerator temperature and the ambient temperature. Thus, a refrigerator having a 40° F. temperature and located in a territory where an ambient temperature of 80° F. is assumed, would have a temperature differential of: $80 - 40 = 40°$.

Plotted Example

Assume a market refrigerator measuring 7′ x 6′ x 9′ high having 3″ corkboard insulation sheathed in wood, to be held at a temperature of approximately 45° F. and located in a section where the mean maximum summer temperature can be assumed to be 90° F.

Such a box will have an outside surface of:

$$(7 \times 6) + (7 \times 9) + (6 \times 9) = 159$$

$$159 \times 2 = 318 \text{ sq. ft.}$$

At all times estimate the outside surface in square feet. Never use the internal surface or cubical capacity.

In the plotted example assume the next nearest figure to the surface involved. In this case, the 318 may be taken as 320 square feet of surface.

Locate column in center of chart labeled "Total Square Feet of Outside Refrigerator Surface." Start at selected surface (320).

Follow line straight across to the left until it intersects the Usage Factor. In this case, use the Meat Market Factor. At this point of intersection, drop down to Refrigerator Wall Insulation. As the insulation involved is 3 inches of corkboard in wood sheathing, drop to this line and then run horizontally to the right to the Temperature Differential assumed in this case to be 45°. At this point follow vertically to the top of chart labeled "Capacity." Read refrigerating effect in B.t.u. or I.M.E.

Size of Unit and Coilage

The capacity for the plotted example will be noted to be 44,000 B.t.u. This is the capacity of unit and of the coilage required to keep the selected example at the stated temperature under specified conditions per 24 hours.

It is not good practice to operate systems longer than 16 hour periods out of the 24, as such operation provides a factor of safety. In case of unusual, occasional heavy loads the system can operate for 20 or 22 hours and maintain proper conditions. Hence, it is desirable to estimate both coilage and machine as capable of doing the work in 16 hours of operation.

Many manufacturers list their products on a sixteen hour basis and the figure obtained as to capacity may be used in the selection of equipment.

Where the manufacturer lists equipment on a 24 hour basis the capacity for sixteen hour operation may be determined by multiplying the capacity given for 16 hr. operation by 3/2, or increasing capacity fifty per cent.

Thus, in the case of the plotted example, if equipment is rated on a 16 hr. basis, coilage and apparatus may be selected from manufacturers' data.

If manufacturer bases capacity on 24 hr. operation, apparatus selected would have to have following rating:

$$44{,}000 \times 3/2 = 66{,}000 \text{ B.t.u.}$$

Thus, a machine rated at 66,000 B.t.u. would be capable of doing 44,000 B.t.u. of work if operated 16 hours.

In the selection of apparatus choose the next nearest rating, except in cases where requirements are quite close to the indicated capacity.

Display Windows

Where display windows are found incorporated in the refrigerator to be estimated for heat load, these glass surfaces must be taken into consideration.

The following table provides factors covering glass areas and should be employed where display windows or glazed doors are encountered.

Do not deduct glass area from the total wall surface, as the factors given in the table compensate properly for this.

Multiply the area of display window in square feet by the conversion factor given the table and add the resulting product to the total wall surface.

In the previous example, a refrigerator having 320 square feet of surface was estimated for heat load. If this box had a display window in one of its sides measuring 5 ft. by 2 ft. and consisting of three panes of glass, the factor (2.9) for this can be located on the chart, opposite the corkboard thickness involved.

This factor must be multiplied by the number of square feet of surface. Thus: $2.9 \times (5 \times 2) = 29$ sq. ft. This would be added to the square feet of refrigerator surface; $29 + 320 = 349$ or 350 sq. ft. of surface. Such a refrigerator would then be estimated as though it was one having 350 sq. ft. of surface without glass.

GLASS FACTORS

In Steel Layers of Glass			Corkboard or Equivalent	In Wood Layers of Glass		
Single	Double	Triple		Single	Double	Triple
3.2	0.7	0.1	1"	6.5	2.0	1.0
5.2	1.5	0.6	1½"	8.3	2.8	1.4
7.2	2.3	1.1	2"	10.4	3.7	1.9
9.5	3.2	1.7	2½"	11.8	4.7	2.4
11.5	4.0	2.2	3"	14.0	5.1	2.9
13.2	4.8	2.7	3½"	16.0	5.9	3.3
15.8	5.9	3.4	4"	17.0	6.3	3.7

Uses for Chart

Salesmen, servicemen, estimators and others interested in estimating the smaller job rapidly will find the Selector Chart a genuine aid. It eliminates mistakes in multiplication or cases where one factor is forgotten or ignored.

Send a Picture and Win a Prize

THE editors are looking for pictures for publication either on the cover or in connection with articles. Pictures of installations—a shop picture, or any other picture of unusual interest showing applications of refrigeration will be accepted.

All contestants whose pictures are accepted for publication will receive a copy of the new book just published on "Commercial Refrigeration." Send your pictures today.

NEW MECHANICAL DEVICES
Service Tools and Special Equipment

Under this heading there will be published illustrated descriptions of new or improved service tools and equipment for the Service Engineer. Information contained in this department is furnished by the manufacturer of the article described and is not to be construed as the opinion of the Editor.

Vacuum Cold Plates

Their Application and Uses. Installation Is Simple and Provide Ample Display Shelf-Room.

WITHOUT exception, refrigeration engineers are thoroughly familiar with the principles and applications of coils in refrigeration, but Vacuum Cold Plates, patented and recently introduced by Dole Refrigerating Company, are so distinctive in form, construction and use that many service engineers have asked us to print an article descriptive of their operation and application to industrial and domestic installations.

DoleCo Patented Vacuum Cold Plates are simple in construction, consisting of a standard coil of tubing, either steel or copper, through which the refrigerant flows, encased in a flat chamber of sheet steel. Where required for hold-over purposes, the Plates are partially filled with eutectic solution and then evacuated. In the straight expansion plates, a 28" vacuum is pulled, which forms a perfect metal-to-metal contact between the plate and coil. After fabrication, the plates are thoroughly rust-proofed by the latest method of spraying molten zinc into the steel.

Due to the vacuum, which removes all moisture from the interior of the plate, together with the perfect metal-to-metal contact, a great cooling efficiency is realized, therefore Vacuum Plates are desirable for work requiring any desired temperature and

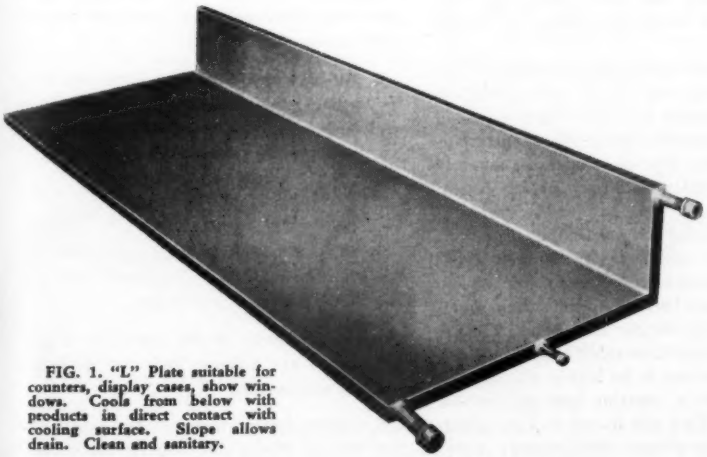


FIG. 1. "L" Plate suitable for counters, display cases, show windows. Cools from below with products in direct contact with cooling surface. Slope allows drain. Clean and sanitary.

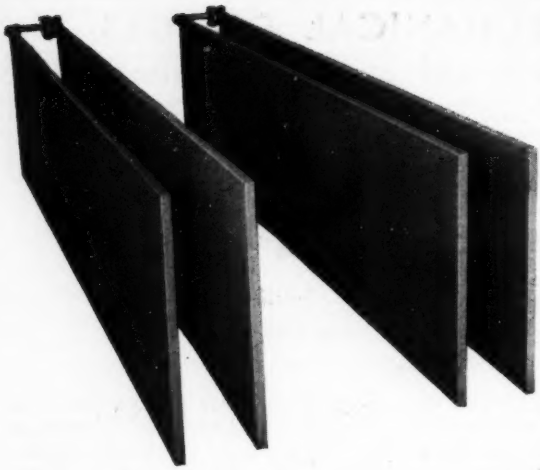


FIG. 2. Plates for Walk-in Coolers. Easily suspended from ceiling or along the walls. Little space required. Highly efficient.

are extremely efficient for uses in connection with the ice cream industry.

DoleCo Vacuum Cold Plates are flat and smooth, consequently they are extremely sanitary and very easy to keep clean. No slime or odors can accumulate. Since the plates are thin and perfectly smooth, little space is required in the cooler and plates can be placed horizontally (to form shelves) or vertically along the wall. They may also be suspended from the ceiling in various positions.

The matter of installation of DoleCo Vacuum Plates is very simple and is done in the same manner in which other types of coils are connected. They will operate perfectly with any type of compressor and will operate efficiently with any known refrigerant.

DoleCo Vacuum Cold Plates are by no means a new article on the market. The patents are approximately six years old and the Plates have been in use in various parts of the country during that time. DoleCo Plates have been thoroughly tested and have proved themselves to be highly efficient and in many cases a superior type of low side equipment. They are in use in such places as ice cream plants, cold storage warehouses, hotels, cheese and butter warehouses, meat markets, restaurants and many other similar applications.

We mention below some of these applications which are of specific interest to the service engineer:

1. Walk-in coolers. Plates shown in Fig. 2, arranged in clusters of two or three, can be suspended from the ceiling or hung along the walls, thereby requiring little space. In this application lower temperatures can be realized at minimum cost.

2. Display cases and counters. Plates shown in Fig. 1 and Fig. 3 provide shelf facilities for meats, fruits, vegetables, candies and similar perishables. Since the Plate forms a solid shelf, the articles can be placed in direct contact with the foods with the exception of small grids placed under the produce to keep it from freezing. A similar Plate is available for window display.

3. Beer coolers. In both pre-coolers and coil boxes a small area of Plate surface is found to be convenient, especially where space is limited and is exceptionally easy to keep clean and sanitary.

4. Milk coolers. Since the Plates are thin, they permit greater storage space for milk in a given box or cabinet. Even temperatures can be maintained throughout.

5. Bottle coolers. Economy of space results in extra accommodation for bottles.

6. Water coolers. In this application, too, the Plates require less space than coils and allow greater space for water.

7. Candy cases. Plates shown in Fig. 1 and Fig. 3 are suitable and very desirable for this application.

8. Cheese, butter and grocery boxes. In this instance Plates also form the shelves and

provide efficient cooling, allowing the merchandise to come in close contact with the Plates except for small grids under the merchandise to keep it from freezing.

9. Ice cream cabinets. Special and standard conversion units, consisting of parallel Plates, may be inserted easily into old brine tank cabinets. The units are made complete, ready for installation, requiring a simple connection to refrigeration lines. Greater ice cream capacity is obtained within the cabinet and lower temperatures can be realized.

10. Trucks. Refrigerated trucks for ice cream, milk and similar delivery find Vacuum Plates especially desirable. The flat Plates are suspended from the ceiling or hung along the walls. Very low temperatures with quick pull-down are easily attained and maintained. The hold-over qualities of these truck Plates allow the owner to pull the temperature down with the same machinery used in the manufacture of ice cream or with compressor installed within the truck, holding desired temperatures over the average day during the warmest summer weather.

11. Standard replacement domestic evaporators. Extremely efficient, attractive in design and easily installed. All models are quick freezers and defrosting is reduced to a minimum since the Plates retain a very slight coating of frost. Standard in 2, 3, 4 and 5 tray sizes. Excellent for replacement work; low in price; all sizes complete with porcelain fronts and doors, hung on attractive spring hinges.

DoleCo Vacuum Cold Plates are handled by active jobbers in all important cities throughout the country. These jobbers carry stocks and will be pleased to assist service engineers in the merchandising of Vacuum Plates, furnishing complete engineering data, standard sizes and all detailed information.

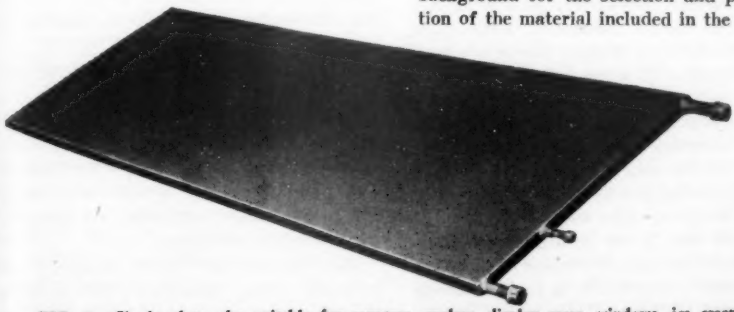


FIG. 3. Single plate, also suitable for counters, coolers, display cases, windows, ice cream cabinets and soda fountains. May be placed horizontally or vertically. The same design, heavier and thicker, is used for refrigerated trucks, filled with eutectic solution for hold-over purposes.

BOOK REVIEW

HERKIMER OIL HEATING AND BURNER MANUAL. By Herbert Herkimer. Published by Herkimer Institute of Mechanical Trades. 16 pages. 8½ x 11 inches. Price, postpaid, $1.00. For sale by Nickerson & Collins Co., Chicago, Ill.

THIS service manual on oil heating and burner equipment will appeal to a number of refrigeration men who are also interested in oil burner servicing. The manual is presented in concise form, contracting in simple arrangement pertinent information that oil burner service men can readily use without recourse to many bulky service manuals and manufacturers' material. The information contained in this service manual will apply generally to all types of oil burners. The manual is a compilation of tables of "causes and effects" or "troubles and complaints." The remedies are generally omitted, or only briefly suggested, because they will be readily obvious to anyone familiar with oil burner service problems. The author, Mr. Herkimer, has had considerable experience in the educational field, and this has served as an excellent background for the selection and presentation of the material included in the manual.

HANDY MASK DEVELOPED FOR SERVICE ENGINEER

CHICAGO Eye Shield Company, Chicago, Illinois, manufacturers of industrial head and eye protection equipment have just perfected a new "Refrigeration Service Men's Healthguard Fume Kit" which should be of great interest to all refrigeration service engineers. This mask is so constructed that the cartridge can be interchanged from one gas to another according to the gas used in the refrigeration plant in which the refrigeration service man may have to work.

"HEALTHGUARD FUME KIT"

Mr. W. A. Whipple, of the Research Department of the Chicago Eye Shield Company, when interviewed regarding the performance of this mask, said in part: "Chicago Eye Shield Company has for some time felt the necessity of supplying the refrigeration service engineer with a mask with interchangeable cartridges for ammonia, methyl chloride and sulphur dioxide. It is interesting to note the wide difference in opinion among various refrigeration service men as to the gas concentration they have encountered in repairing a leak in a refrigerating plant. It is not unusual to hear a service man state that, when he repaired a leak in a plant, there must have been at least a 10% concentration of ammonia or sulphur dioxide in the air, and that he dashed in without a mask, shut down the plant, opened the windows, and came out. When asked if he did all this in one breath, he generally states that "he took a few short breaths but didn't mind it very much as he had become accustomed to the gas."

These same men when brought into an accurately controlled gas chamber were surprised to learn that what they thought was a 10% concentration actually proved to be, in the case of sulphur dioxide, less than 5/100 of 1%, and ammonia 3/10 of 1%.

There is no question that even these concentrations are decidedly dangerous. I do not believe that the average refrigeration service man fully appreciates how powerful and irritating ammonia and sulphur dioxide really are, nor do I believe that they are aware of the fact that concentrations of ammonia of 3/10 of 1% and of sulphur dioxide 5/100 of 1% are considered very dangerous even to the extent of 3 or 4 inhalations of atmosphere containing this amount of gas. The maximum concentration allowable for exposure from ½ to 1 hour for ammonia is only 5/100 of 1% and for sulphur dioxide 1/1000 of 1%.

While these dangerous concentrations of gas are not frequently encountered in a service man's routing, there are times when a suitable mask with the proper absorbent is absolutely essential, and with the inexpensive light respirator type mask which the Chicago Eye Shield Company has just perfected, there is no necessity for a service man to be without a mask. This mask is small, light in weight, and self-contained in one facepiece. It will give 3 to 4 minutes' protection to the wearer in dangerous concentrations of either ammonia, sulphur dioxide, methyl chloride, and affords ample time to open windows and shut off the leak.

This mask should not only be worn in dangerous concentrations, but should certainly be used when the concentrations have reached a point where they become irritating. Concentrations usually causing irritation are generally conceded as follows:

Irritation to the throat by ammonia—5/100 of 1%.

Irritation to the throat by sulphur dioxide —1/1000 of 1%.

In these concentrations, the "Healthguard Fume Mask" may be worn for a considerable period without permitting any gas passing through to the wearer."

The Chicago Eye Shield Company has prepared a very attractive folder covering the different features of their "Healthguard Fume Kit."

The Small Commercial Condensing Unit

Improved Manufacturing Facilities Contribute to Operating Performance of Condensing Units.

By RAY F. POLLEY*

Recent addition to Mills Novelty Factory where compressors are built

EDITOR'S NOTE.—*Mills Novelty Company was established in Chicago in 1889 by H. S. Mills, father of the present owners. In its big 26 acre modern factory on the northwest side of Chicago it employs 1220 people, and in addition has a field force of 80 district sales managers and over 500 salesmen. Its service organization numbers 400 experts in the refrigeration field.*

The company is an organization of young men, not an important executive in the concern being over 40 years old. During the last six years of the depression its annual sales have been trebled and six separate factory additions had to be built. The concern is noted for its modern business spirit, its smart advertising and merchandising, and its minute regard for the essentials of fine engineering and machining developed out of producing millions of practical coin operated mechanisms of the most involved nature.

Ray Polley, one of the country's best known refrigeration men, and a man who has graduated from the service ranks right on through the engineering departments and supervision of assembly, is the new sales manager of Mills Compressor Division. Mr. Polley likes to hear from his old friends and is always more than willing to discuss refrigeration problems with any man in the industry.

THE small commercial high side, or condensing unit, has attracted more engineering and industrial attention than has the industrial machine.

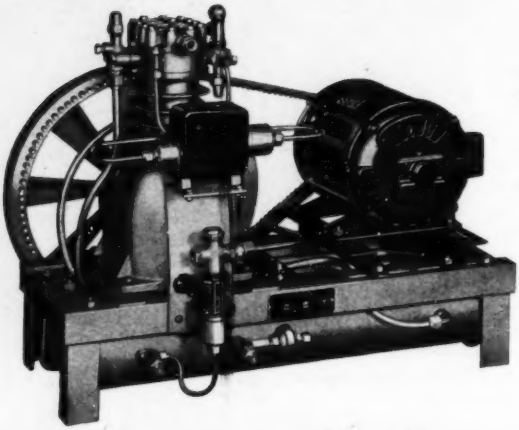
A decade ago the small machine was merely a diminution of the larger, but radical departure from the large machine practice that has since matured.

Many of the achievements in the small machine have been adopted by the large-machine builders, as the small commercial machine made very serious inroads in their commercial business. Small commercial condensing units are mounted on a cast iron or welded steel base on which the motor, controls, and condensing coils are also mounted, making a complete assembly and simplifying the installation of the equipment; whereas, on a larger industrial machine, it was necessary to build up the equipment at the location. A minimum noise and very little attention are requirements of the small machine. Quiet operation largely depends upon the precision of workmanship on the compressor, and the mounting arrangements of the complete assembly.

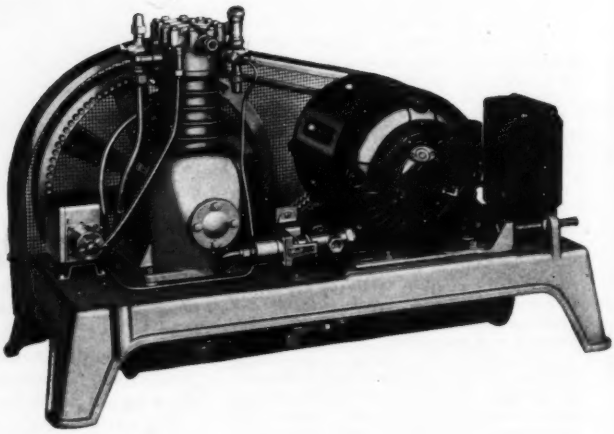
The refrigerating system can be compared very favorably to the present and former automobile engine. It was only a short while ago that the automobile engine was accepted as a mechanical device that could not be expected to operate quietly; but with the use of modern machinery and precision tools it has been possible to build and operate an automobile engine with practically no operating noise, without any radical change in design. The present automobile engine is very similar in appearance and construction to the former engine.

This condition is also true of the small commercial refrigerating machine. It has been necessary to change the design of the compressor but very little. With the use of modern machinery, the Mills compressor has

* Sales Manager Compressor Division, Mills Novelty Co., Chicago, Ill.



MILLS ¼ H.P. COMPRESSOR



NEW 1½ H.P. MILLS COMPRESSOR

been built to very close tolerances, and with modern machinery, precision tools and gauges, it is possible to build any number of compressors so that they will all operate quietly and efficiently. It is also possible to speed up production with our modern tool equipment. This use of modern machine tool equipment enables the operator to sell the compressor in competition with the cheaply constructed equipment.

Noise in any mechanical device is very undesirable, as it indicates a misaligned or poorly-fitted bearing, and this continued noise, due to this condition, never corrects itself—in fact, it will eventually result in the complete failure of the equipment, at which time it will be necessary to completely overhaul the entire mechanism. A properly designed compressor with proper bearing clearances does not have to resort to the use of heavy oil to quiet its operation. Heavy oil from a refrigerating standpoint is very undesirable as when the oil would enter the low side of the system it would retard refrigeration due to the insulating effect of the oil, and in some cases would entirely restrict the flow of refrigerant; and, of course, the heavy oil pumping out of the crankcase and depositing in the low side of the system means that the compressor does not have the proper lubrication due to this lack of oil. We can recall when it was considered very

necessary to overhaul an engine at certain periods for checking up of bearings, grinding of valves, but it is rather unusual to find that the modern automobile engine requires taking up of bearings. In most cases, the automobile is operated over many years before any engine repair work is necessary.

Bearing Surfaces

The bearing surfaces of any mechanical device is properly machined so that an even contact is secured. This bearing load is distributed over the entire area, making it possible to maintain the necessary film of oil between the two bearings; and the fact that the bearing has the proper clearance and is properly aligned, quite naturally results in the bearing lasting indefinitely.

It is rather unusual for a manufacturer to be in a position to completely equip the entire department with new and special machinery that has been designed for that particular operation on that compressor. Every machining operation on the completed unit has been thoroughly studied and analyzed and the proper equipment secured for that operation. Most manufacturers find it necessary to use old equipment that has been used on older models, making it necessary to design the equipment so that it can be machined by the machinery that they have on hand. All modern machining methods are used in the manufacture of Mills equipment, —diamond-boring equipment of the latest type, hydraulic-control grinding machinery, the latest type of honing devices, height indicators for testing gauges indicates to a 10/1000 of an inch, both as to size and misalignment of the closely machined mechanical device, quite naturally simplifies any repair work, as all parts are interchangeable.

The design of the compressor allows the removal of any part without disturbing any other part—for example, the seal assembly. In the former compressors this was a source of a considerable amount of difficulty, for various causes. One of them was misalignment. If the shaft was not exactly aligned with the seal proper, it would cause the seal proper to weave, and this continuous activity on the part of the seal assembly would quite naturally result in excessive wear and eventually—a failure.

Lubrication

Improper lubrication was another source of difficulty. In the Mills compressor a continual bath of oil is supplied to the seal assembly by the use of generous oil cups and return line from the seal assembly bearing housing. Then after all of these precautions, if it did become necessary to replace the seal assembly, it can be replaced as a complete packaged unit. On the conventional type of compressor it was necessary to disassemble the complete compressor, regrind the shaft, and this was not always desirable, as it was possible to grind below the hardened surface which would result in a short-lived repair. But, with the Mills seal assembly which can be tested before being installed in the compressor, it is possible to handle this important service operation by replacing the complete unit, which has been tested, with the assurance that it will hold properly. Both the suction and the discharge valves are incorporated in the head, making it a very simple operation to test them, also handle any repairs or replacements in the event they are found necessary.

Oil Slugging

This eliminates the necessity of bringing the returned gases through the crankcase where they will pick up a definite amount of oil and lower the level of the lubricating oil in the crankcase, which you can appreciate is very desirable. It also cuts down the slugging of oil in changing the pressure as is common in many refrigerating devices. It is very desirable to maintain a proper level of oil in the crankcase without any external devices, and this has been accomplished by the valve design in the Mills compressor, together with the proper design and proportion of the crankcase. This eliminates the necessity of putting valves in the piston. All castings, of course, are of a special grade of close-grained iron having a chromium and a nickel content for proper bearing and close-grained structure. The new Mills compressor will be built in sizes for ¼ hp. to 7½ hp.

THE Question BOX

Readers are invited to send their problems pertaining to the servicing of household refrigerators and small commercial refrigerating equipment as well as oil burners to "The Question Box" which will be answered by competent authorities.

THE following questions submitted to this department are answered by Mr. George H. Clark, chairman National Educational and Examining Board, Refrigeration Service Engineers Society.

Have any readers other opinions regarding the problems involved. Send them to the Editor.

Head Pressure

QUESTION 124. *Refrigerators that use a capillary tube only from condenser or receiver to evaporator are sensitive to amount of refrigerant in system. Would not a variation in head pressure cause a difference in amount of liquid that reaches evaporator? If non-condensable gas gets into the system and causes head pressure to rise, wouldn't it cause more liquid to be forced into evaporator? And probably cause a frost back? Or vice versa?*

ANSWER: The difference in head pressure would not cause an extra large amount of liquid to pass to the evaporator unless an extra amount was condensed which would, of course, happen with a high suction pressure.

If non-condensable gases get into the system causing an excessively high head pressure, it could not force any more liquid into the evaporator because there would be no more liquid to force in. There is little danger of a frost-back in the system using a capillary tube as the quantity of refrigerant is only sufficient to fill the evaporator to the proper level.

If the non-condensable gases got into the capillary tube, it would simply pass through the capillary tube as a gas and the quantity that would pass through as a gas would be very small compared with the quantity in pounds that might be circulated as a liquid. In fact, the capillary tube would not pass gases as fast as the compressor would compress them. The gases must condense into a liquid in order to be able to get through the tube at the same rate gas is being compressed. The volume of the liquid may vary from $\frac{1}{100}$ to $\frac{1}{400}$ of the volume of the vapor.

Buckeye Refrigerator

QUESTION 125. *My problem is in reference to a Buckeye refrigerator—6 cubic foot box—single cylinder, reciprocating compressor, open type. This compressor in operation has a tapping sound which is distinct enough to be heard all over the room. This tap in the compressor resembles the tapping on a window pane with a nail. I should say five taps per second.*

One thing I wish to make clear is that this sound is not constant. It may be heard at the beginning of a cycle or right before the unit cuts out, or at the most unexpected moment. The hp. and b.p. are O.K. There is no fluctuation of pressures at all when this sound is heard.

Some of the things I have checked which I thought might cause this are: expansion valve, pressures, oil, compressor which I had disassembled and found everything O.K. as to fits of connecting rod, wrist pin, flapper valve, and play in crank shaft and for anything that might be loose.

This unit is only eight months old and has been doing this since the day it was bought by the present owner. Do you think it is the construction of the compressor?

This is the first Buckeye unit I have serviced and I don't know what it is. In closing, I hope I have given you all the information you need to help me in this matter.

ANSWER: The tapping noise which you describe in the compressor in my estimation is probably the head valve of the compressor. The fact the noise is not always present is probably due to some difference in oil circulating conditions that occurs during the cycle. I have run up against the same condition on other makes of compressors and it may in some cases be eliminated or minimized by making an adjustment to allow

less movement of the valve during normal operation.

This is the only thing I could suggest from your description of the noise.

Atwater-Kent Refrigerator

QUESTION 126. *I would like to have information as to the setting of the expansion valve and pounds of gas used in the 1935 Atwater-Kent domestic refrigerator.*

ANSWER: The expansion valve used is of the thermostatic type and operates very similarly to the flooded coil. With methyl chloride as the refrigerant, it opens at about 15 lbs. back pressure, from which point the back pressure is greatly lowered until the thermostat switch stops the compressor.

The expansion valve is considered to be non-adjustable. The variations in back pressure may be secured by changing the position of the thermostat bulb in relation to the evaporator or drier line temperatures.

One lb. of refrigerant is the correct charge for the Atwater-Kent refrigerator, with a ¼ lb. overcharge limit.

Cooling Tower

QUESTION 127. *I have some refrigeration work to do on an inside cooling tower. The tank or pan is 16" deep, 4'9" long, 8'3" wide, has 315 gal. water capacity. There is a total of 70 spray nozzles and 7 flooding nozzles with a capacity of 1.75 gal. per minute per nozzle, or a total capacity of 122½ gal. per minute.*

This water is used over and over. A Fairbanks-Morse 150 g.p.m. centrifugal pump, run by 5-hp. motor. This water in the pan has to be cooled from 75° to 50° and held at 50°. This will have to be used during July and August.

What size air cooled compressor would you advise and what size tubing and length—½" or ⅝"? Would you advise F-12 gas or methyl chloride?

I plan on using a high side float or a thermostatic expansion valve.

This being my first installation of this type, what price should I get for this equipment installed?

ANSWER: I am not exactly sure that I understand your problem.

The cooling tower itself is ordinarily used to dissipate heat. That is, the cooling tower evaporates a certain portion of the water which thereby cools the rest of the water as the latent heat is added to the water which evaporates from the water which remains.

I gather, however, that in your particular job, for some reason, it is very important that the water be cooled down to a temperature of 50°. You state that you have a 150 gal. per min. centrifugal pump and that the water has to be cooled from 75° to 50° and maintained at that temperature. I imagine the installation, then, is one which requires refrigeration at comparatively high temperatures. That is, well above 50°, such as might be obtained in an air conditioning installation where sensible cooling only is to be done and that during July and August sufficient cooling can not be obtained by evaporation of the water.

The heat load, in this case, may be found by multiplying 150 gal./min. times 8#/gal. times 25° temperature change which would be something over 30,000 B.t.u./min. This would be equivalent to about 150 tons of refrigeration.

This would seem like an entirely unreasonable sort of a problem and from the information given I can not tell definitely what your cooling load is. If you do definitely have to cool 150 gal./min. of water through a temperature difference of 25°, you will have to have a machine having a capacity of at least 150 tons and such an installation, of course, would cost a good many thousand dollars.

If you can send more information as to what the job is being used for so that I might get an idea as to what the heat load actually is, I could give you a more definite idea as to the size of machine required.

B.t.u. Values

QUESTION 128. *I am not able to understand the time element involved in the relation of B.t.u. value to watts.*

1 kilowatt hour equals 3,410 B.t.u., or 57 B.t.u. per minute (approximately).

3,410 B.t.u. divided by 1,000 equals 3.4 B.t.u. per watt.

778 ft. lbs. equals 1 B.t.u.
33,000 ft. lbs. per minute equals 1 hp.
33,000 ft. lbs. divided by 778 B.t.u. equals 42.42 B.t.u. per hp.
746 watts equals 1 hp.
also 42.42 B.t.u. equals 1 hp.
746 watts divided by 42.42 B.t.u. equals 17.5 watts per B.t.u.

It stands to reason I am wrong. Will you kindly show me where I am wrong?

What I want to know is how many watts in a B.t.u., or how many B.t.u. in a watt.

When figuring a heating load in B.t.u.'s, it will be necessary, or at least more convenient, to change it to watts when the heating is to be done by electricity.

I hope I have made my calculations comprehensive.

ANSWER: Your confusion respecting the energy and power units is quite common and, I believe, is due to the fact that most of our energy units have means which do not involve any time element, such as foot-pounds or B.t.u.

Electrical energy, however, is measured in terms of the rate of using energy or power which is multiplied by time. That is, one kilowatt hour is a unit of energy. One kilowatt hour is the quantity of energy used when we use power at the rate of one kilowatt for one hour's time. We would also use one kilowatt hour if we used 500 watts for two hours' time or 50 watts for 20 hours' time.

The equivalent amount of heat or ft. lbs., then, does not vary or have any relation to time. One kilowatt hour equals 3,417 B.t.u's. regardless of whether that kilowatt hour is used in one minute, one hour or one year.

Your confusion is entirely resulting from this factor, I believe, and I am listing below the various energy units and also the various power units together with the equivalent energy units and the equivalent power units. I believe this will clarify the situation somewhat.

The units of energy and corresponding power units may be listed as follows:

Kind of energy or power	Energy	Power
Mechanical	ft. lbs.	$\frac{\text{ft. lb.}}{\text{min.}}$ or $\frac{\text{ft. lbs.}}{\text{hr.}}$ or horsepower
Heat	B.t.u. I.M.E. Tons of Refrigeration	$\frac{\text{B.t.u.}}{\text{min.}}$ or $\frac{\text{B.t.u.}}{\text{hr.}}$ or I.M.E. or tons of refrigeration per 24 hrs.
Electrical	watt hours or kilowatt hours	$\frac{\text{watt hrs.}}{\text{hr.}} = \text{watts}$ $\frac{\text{kilowatt hrs.}}{\text{hr.}} = \text{kilowatts}$
Eneregy and power equivalents	778 ft. lbs. = 1 B.t.u. 3.42 B.t.u. = 1 watt hr. 2,658 ft. lbs. = 1 watt hr. 144 B.t.u. = 1# I.M.E.	33,000 ft. lbs./min. = 1 hp. 42.42 B.t.u./min. = 1 hp. 1,980,000 ft. lbs./hr. = 1 hp. 2545 B.t.u./hr. = 1 hp. 746 watts = 1 hp. 3.42 B.t.u./hr. = 1 watt .057 B.t.u./min. = 1 watt 144 B.t.u./24 hrs. = 1 I.M.E./24 hrs. 288,000 B.t.u./24 hrs. = 1 ton/24 hrs. 12,000 B.t.u./hr. = 1 ton/24 hrs. 200 B.t.u./min. = 1 ton/24 hrs.

Conditioned Air Evaporator

QUESTION 129. *Our problem is a conditioned air evaporator.*

We have a ⅓-hp. York (414FA) Freon compressing unit and a GE (EC 15-A16) SO_2 *conditioned air evaporator, installed with a thermostatic control. On installation we changed the* SO_2 *thermostatic expansion valve to a Freon valve and used Freon.*

Now, with a 70° condensing medium the head pressure remains at 120 lbs. with a 20 lb. back pressure while at the same time the liquid line is warm to the expansion valve. By adding gas enough to cool the liquid line and the bottom half of the liquid receiver, the head pressure does not rise, but to maintain a temperature of 36° to 40°, per customer demand, we find the evaporator loaded with frost and ice after four or five days operation. 38° to 40° seems to be the lowest temperature we can get and avoid severe frosting—even to three feet beyond the expansion valve bulb.

All the equipment responds readily to adjustments and efficiency tests.

Our question is: Would using Freon in an SO_2 *evaporator alter the B.t.u. capacity enough to cause the above condition? Based on* SO_2 *figures the evaporator displacement tallies closely with the compressing unit capacity (Freon).*

ANSWER: From the statement of your problem, it is very evident that the coil is under-sized for the condensing unit you are using and for the temperatures you are trying to maintain. In all probability this coil would be suitable for a small air conditioning job where the air temperature over the coil would be well over 70°; but where the air temperature over the coil is down to 40°, the coil is carried at such a low temperature with this condensing unit that the coil gathers frost which of course will cut down on the performance of the coil.

You did not state whether the machine shuts on and off with the pressure control. If it does, it may be possible that this coil will take care of the job satisfactorily, provided the cut in pressure is high enough so that the coil thoroughly defrosts during an off period.

For Freon, I would recommend a cut in pressure of approximately 35 lbs. gage. The cut off pressure may be varied to give the temperature required in the cooler. As long as the machine is able to pull the temperature down and shut off at least once in six hours time you should be able to operate without excess frosting on the coil, but if the control is set so that the cut out pressure is too low, the machine will operate continuously and keep on building up frost on the coil. I would suggest that you try a setting of 16 to 35 lbs. If this setting causes the machine to operate continuously, adjust the control so that it will cut out. If this setting allows the machine to stop periodically and does not give a low enough temperature in the cooler, set the cut off pressure slightly lower.

Copeland

QUESTION 130. *I am taking on a job which three other service men turned down. To start from what I think is the beginning, the motor of the compressor is a Copeland 1-hp., the compressor a twin cylinder, whose maker's name I cannot find. The only mark on the compressor is an S. Sulphur dioxide is the refrigerant.*

The trouble is it will not freeze. It has four separate float valve coils,—two on each side of the ice box. The shut-off valve on the receiver leaked when I started to screw off the cover that protects the valve stem so I did not take it off. I screwed it back on and then went to the ice box to cut one side and turn the valve stem to close it. The refrigerant boiled out past the stem like boiling water.

Does the system have too much refrigerant, or can it be that the float valves are out of order? The discharge pipe gets very hot while the compressor is in motion; this is air, I know, but can it be moisture too?

ANSWER: My suggestion on your particular service problem would be that you pump the refrigerant out of the system into a refrigerant drum and that you then start in to put the system in good shape.

If the valves are altogether too troublesome, I would suggest that the packing be replaced or that the valves be replaced. I

should suggest also that the float valves be checked to see that they close off at the right level and also to be sure that the valves do not leak too rapidly when they are in the closed position.

If there are any evidences of corrosion due to moisture, it would be well to thoroughly bake out the whole machine and coils. The fact that the discharge line from the compressor gets very hot while the compressor is in operation is a healthy sign as it indicates that the compressor is pumping refrigerant at a good rate. This does not mean that there is air in the system nor moisture either. It may be, if there was too much refrigerant in the system so that there was not as much condensing surface available as there should be, that the line from the compressor would get unusually hot.

You could get more information if we had a record of the pressures that obtain in both the high pressure and low pressure sides of the system and whether the suction line was warm or cold and whether it is an air-cooled or water-cooled machine.

If the coils are the ones I have in mind, they will probably require from 8 to 10 pounds of refrigerant each so that I would suggest a total charge of 45 lbs. of refrigerant may be required to operate all the coils satisfactorily.

FILTERPURE ANNOUNCES JOBBERS

THE Betz Corp., Hammond, Ind., manufacturers of "Filterpure," the air filtering and circulating device for refrigerator cases and cabinets, has recently announced the list of jobbers who will serve as the sales outlets for the refrigeration service field. These jobbers include:

Melchior, Armstrong, Dessau Co., Cambridge, Philadelphia, Baltimore, Rochester, Harrisburg, Brooklyn, New York City

Harry Alter Co., St. Louis, New York City, Chicago

Williams & Co., Pittsburgh, Cleveland, Cincinnati

Forslund Pump & Mach. Co., Kansas City

Spangler Co., St. Louis, New Orleans

Airo Supply Co., Chicago

Refrigeration Supplies Distributor, Cleveland, Birmingham, Los Angeles

Beckett Electric Co., Dallas

Starr Co., Richmond, Ind.

H. W. Blythe Co., Chicago

H. Channon Co., Chicago

F. H. Langsenkamp Co., Indianapolis

The Merkel Bros. Co., Cincinnati

Refrigeration Service, Inc., Los Angeles

Refrigeration Service & Supply Co., Honolulu

Thermal Service Co., St. Paul

W-M Refrigeration Co., Milwaukee

All of the above jobbers stock "Filterpure" machines for immediate delivery. Factory production is now 500 units per month, and it is anticipated that on May 20 this production will be increased to build 1,000 units per month.

ROTARY SEAL ELECTS NEW VICE PRESIDENTS

AT the annual meeting of the Board of Directors of the Rotary Seal Co., Chicago, on April 15, Mr. H. Jensen, superintendent, was elected a vice-president in charge of production.

At the same time, Mr. Walter W. Meyer was elected a vice-president in charge of sales engineering.

NEW 1936 CATALOG ISSUED BY PEERLESS

PEERLESS catalog is now available, illustrating new coils, new products, new prices, illustrations of the new products, and complete engineering data. Among the features of the new catalog are the simplicity of finding coil sizes and prices for any requirements and short cuts in engineering. One large feature of the Peerless coils for 1936 is that all coils have rifled tubing. The rifled tubing is explained and illustrated in colors.

The Peerless products are fin coils, Peerless off-center coils, off-center freezer coils, flash coolers, unit coolers, barepipe coils, comfort coolers and air conditioning coils, "Humidi-Pack" household evaporators, ice

cube makers, finned ice cube makers, floor type unit coolers, thermal expansion valves and heat exchangers.

The catalog is available to all service men by addressing the Peerless Ice Machine Company, 515 W. 35th Street, Chicago, Illinois, or Peerless Ice Machine Company, 43-00 36th Street, Long Island City, New York.

NEW FINANCING PLAN ANNOUNCED BY PARTS DISTRIBUTOR

A PRACTICAL financing plan, designed to assist the independent service man to compete on a competitive basis with other organizations in the installation of commercial equipment, has been announced recently by H. Channon Co., Chicago.

According to Mr. Ralph Kramer of the above company, the plan offers an exceptional opportunity for the service organization that may find itself out of competition on many jobs due to its inability to secure prompt financing, a chance to secure this profitable business.

The plan, with all its desirable features, bears a very low interest rate, being called the 5% plan. If the prospective account is satisfactory, financing arrangements can be secured within three days. The minimum monthly payment has been established at $25.00, with not less than 20% as down payment. The payments may be extended over a period of 24 months. The H. Channon Co. invites inquiries from any service company on this plan.

EXTERIOR OF WAREHOUSE AND INTERIOR OF SALES DEPARTMENT, BORG-WARNER SERVICE PARTS CO.

BORG-WARNER

THE Borg Warner Service Parts Company, Chicago, a division of Borg-Warner Corporation, has expanded its refrigeration department.

The new home is located on the Southwest corner of Twenty-first Street and Indiana Avenue and occupies 6,000 square feet on the ground floor. The parts are stocked on steel shelving and the display cases indirectly illuminated.

For many years Borg-Warner Service Parts Company has been one of the leading distributors of automotive parts, with fourteen warehouses located throughout the country.

The refrigeration department has been in operation for over one year and the coming year looks even brighter than the past one for expansion, according to A. C. Darling, Vice-President and General Manager of the Company.

The sales staff includes B. B. Dawes, J. Fulford, and W. A. Smith. K. Bergquist and G. Grindley are in charge of the Chicago Branch.

REMPE COMPANY'S NEW FIN COIL CATALOG

JUST recently issued is the new catalog of the Rempe Fin Coil Co., 840 N. Sacramento Blvd., Chicago, Ill., consisting of 64 pages, 8½"x11" in size, listing the complete line of Rempe Company fin coils, which incidentally provides a simple method for selecting the proper size of fin coil for various types of service.

JOSEPH O. SHULTZ

Each size of coil is arranged in simple tabulated form so that when the size of the refrigerator is known, the number of coils can be readily ascertained: the dimension of the coil, the square feet of surface, and the B.t.u. capacity per hour per degrees.

The catalog is the result of the work of Mr. Joseph O. Shultz, manager of the Fin Coil Division of the Rempe Company, in collaboration with Mr. George White.

The Rempe Company has reported a considerable increase in the Fin Coil Division of their company and, as always, are manufacturing pipe bends and pipe coils for every refrigerating service.

LOW-PRICED BAKING OVENS FOR SERVICE MEN

THE well-equipped service shop today includes a baking oven which finds a multitude of uses in the refrigeration servicing field. The Despatch Oven Co., 622 Ninth St., S.E., Minneapolis, Minn., are manufacturers of such ovens.

Despatch Type C oven is particularly adaptable to the refrigeration service field, and is a general utility oven for dehydrating compressor units as well as baking and drying finishes and insulating varnishes.

The ovens are equipped for use with either gas or electricity, and range in price from $48.00 upward. Standard ovens are shipped immediately from stock.

A complete descriptive catalog of the various types of baking ovens available will be sent to any service man upon request to the company.

RESEARCH BODY ESTABLISHED FOR THE MODERN HOME

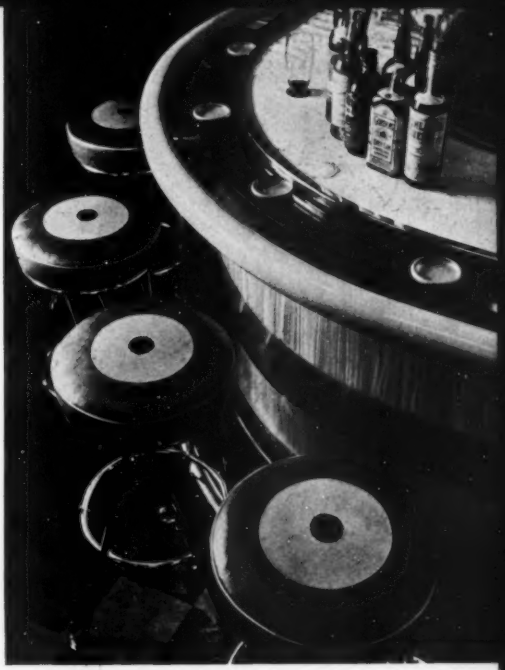
AS a forward step in extending the benefits of modern science and manufacturing to the American consumer, George W. Mason, president of Kelvinator Corporation, today announced that the company had established and was maintaining The Temperature Research Foundation, with headquarters at 80 Broadway, New York City.

This Foundation, following Lord Kelvin's principle that "the life and soul of science is its practical application," will be devoted to disseminating the latest scientific facts and figures on temperature research. It will aim to advance standards of health, comfort and leisure among American consumers in the fields of heating, food preparation and preservation and air conditioning in home, office and factory.

Advisory Committee

The Foundation will operate under an advisory committee which includes Dr. Shirley W. Wynne, former Health Commissioner of New York City; Dr. Warren M. Persons, consulting economist and former professor of economics at Harvard University; Francis Keally, architect; Count Alexis de Sakhnoffsky, consultant designer; Lulu G. Graves, consultant in nutrition and organization of dietary departments; and Anne Pierce, consultant in home economics.

Mr. Edward Heitman, chief engineer of Kelvinator, will be director of the Foundation, which will operate in the interest of the public welfare.



a Unique Bar Installation

A BAR owner in Copenhagen, the capital of Denmark, has just released a practical idea. He has created one of the most original drink bars in the world. The tables in this bar, as well as the serving bar itself, are able to conserve all drinks and to keep them cool, for in the center of the tables and running the entire width of the bar, there is an ice plate connected with an ice machine in the cellar. The illustrations reproduced above show the cool frosted surface upon which the drinks rest. At the right is shown a part of the bar with its frost covered ice frame, and at the left is a close-up view of one of the tables showing the ice plate, on the surface of which there is a considerable depth of frost.

Amended Code Proposed for Chicago Refrigeration Installations

The Building Code Subcommittee of the City Council Has Received the Amended Code on Mechanical Refrigeration Which Was Prepared by the Department for the Inspection of Steam Boilers, Unfired Pressure Vessels, and Cooling Plants.

CONSIDERABLE interest has recently been shown in municipal refrigeration codes. Many cities have antiquated codes that have outserved their usefulness, and are planning revisions to include advance features incorporated in the present-day refrigerating equipment.

The following excerpts from the proposed revised code submitted to the Building Code Subcommittee of the City Council contain that portion of the code as it applies to the refrigeration equipment of interest to the readers of THE REFRIGERATION SERVICE ENGINEER:

MECHANICAL REFRIGERATION

SECTION —— *Scope.* The following provisions shall apply to every refrigerating system employing any refrigerant which is expanded, vaporized or compressed in its refrigerating cycle.

Every such refrigerating system shall be constructed, installed and maintained in accordance with these provisions.

SECTION —— *Definitions.* For the purpose of this ordinance the following definitions shall apply:

Air Conditioning System: A refrigerating system used for the control of temperature or humidity of air that is circulated by means of fans or blowers to space, or spaces, occupied by people, or where used for comfort cooling.

Approved: Official approval by the authority having jurisdiction.

Brine Cooler: An evaporator for cooling brine in an indirect system.

Check Valve: A valve allowing refrigerant flow in one direction only.

Compressor: A compressor is any device having one or more pressure imposing elements, used in a refrigerating system to increase the pressure of the refrigerant in its gas or vapor state for the purpose of liquefying the refrigerant.

Condenser: A vessel or arrangement of pipe or tubing in which the vaporized refrigerant is liquefied by the removal of heat.

Direct System of Refrigeration: A system in which the evaporator is located in the material or space refrigerated or in air circulating passages communicating with such space.

Emergency Relief Valve: A manually-operated valve for the discharge of refrigerant in case of fire or other emergency.

Evaporator: That part of a system in which refrigerant is expanded or vaporized to produce refrigeration.

Flammable Refrigerant: Any refrigerant which will burn when mixed with air.

Fusible Plug: A device having a fusible metal that will melt at a maximum temperature of 200 F. for the relief of pressure.

Generator: A generator is any device equipped with a heating element used in a refrigerating system to increase the pressure of the refrigerant in its gas or vapor state for the purpose of liquefying the refrigerant.

Indirect System of Refrigeration: A system in which a liquid, as brine or water, cooled by the refrigerant, is circulated to the material or space refrigerated or is used to cool air so circulated.

Irritant Refrigerant: Any refrigerant which has an irritating effect on the eyes, nose, throat or lungs.

Liquid Receiver: A vessel permanently connected to the high pressure side of a system for the storage of refrigerant.

Mixer: A vessel or device for mixing the refrigerant with another substance.

Multiple System: A multiple system is a system employing the direct method of refrigeration in which the refrigerant is delivered to two or more evaporators in separately refrigerated spaces.

Multiple Dwelling System: A refrigerating system employing the direct method in which the refrigerant is delivered by a pressure imposing element to two or more evaporators in separate refrigerators or refrigerated spaces located in rooms of separate tenants in multiple residence buildings.

Pressure Limiting Device: A pressure—or temperature—responsive mechanism for automatically stopping the operation of the pressure imposing element at a pre-determined pressure.

Pressure Relief Device: A pressure relief valve, a rupture member, a fusible plug or other approved device for relieving pressure.

Pressure Relief Valve: A valve held closed by a spring or other means, which automatically relieves pressure in excess of its setting.

Pressure Vessel: Any refrigerant-containing receptacle of a refrigerating system other than expansion coils, headers and pipe connections.

Rupture Member: A device which will automatically rupture at a pre-determined pressure.

Sealed Unit: A pressure imposing element which operates without stuffing-box, or which does not depend upon contact between moving and stationary surfaces for refrigerant retention.

Shell Type Apparatus: A refrigerant-containing pressure vessel having tubes for the passage of a heating, cooling or refrigerating fluid.

Ton of Refrigeration: A ton of refrigeration is heat removal at the rate of 12,000 B.t.u. per hour. (For the purpose of fees charged, see fee section, chapter 51.)

Unit System: A system which can be removed from the user's premises without disconnecting any refrigerant—containing parts and which does not contain more than 10 lbs. of any refrigerant.

SECTION —

Classification of Refrigerating Systems

Refrigerating systems shall be classified according to the total weight of refrigerant contained in or required for their proper operation.

Class "A" system is one containing one thousand (1000) pounds or more of refrigerant.

Class "B" system is one containing more than one hundred (100) pounds but less than one thousand (1000) pounds of refrigerant.

Class "C" system is one containing more than twenty (20) pounds but not more than one hundred (100) pounds of refrigerant.

Class "D" system is one containing more than six (6) pounds but not more than twenty (20) pounds of refrigerant.

Class "E" system is one containing six (6) pounds or less of refrigerant.

Flammable refrigerants or refrigerants of a poisonous nature when used in systems containing more than 6 pounds of refrigerant, shall have added a substance which will impart a pungent odor or an irritating quality to the refrigerant, unless vapors are readily apparent to human sense.

(d) Indirect systems operating below atmospheric pressure containing not more than 2000 lbs. of a Class 2 non-irritant and non-flammable refrigerant may be installed provided all refrigerant containing equipment is placed in a machinery room located on the first floor or in the basement, as provided above.

(e) Indirect systems containing 100 lbs. or less of Class 1 or Class 2 non-irritant and non-flammable refrigerant may be installed on the roof or in a pent house provided all refrigerant containing parts are placed in a machinery room as provided above.

* * * * *

Classification of Refrigerants

SECTION ——

For the purpose of this ordinance refrigerants shall be classified as follows:

NON-IRRITANT AND NON-FLAMMABLE		FLAMMABLE		IRRITANT
Class 1	Class 2	Class 1	Class 2	
Carbon Dioxide CO_2	Diochlorodifluoromethane CCL_2F_2	Methyl Chloride CH_3CL	Ethane C_2H_6	Sulphur Dioxide SO_2
	Monofluorotri chloromethane $CFCL_3$	Dichloroethylene $C_2H_2CL_2$	Propane C_3H_8	Ammonia N H_3
	Dichlorotetra fluoroethane $C_2CL_2F_4$	Ethyl Bromide C_2H_5BR	Isobutane CH_4H_{10}	
	Dichloromethane CH_2CL_2	Methyl Bromide CH_3BR	Butane C_4H_{10}	
			Ethyl Chloride C_2H_5CL	
			Methyl Formate $C_2H_4O_2$	

LIMITATIONS AS TO USE AND SPECIAL REQUIREMENTS

Institutional Occupancies: Direct expansion refrigerating systems shall not be placed in wards, private and operating rooms of hospitals or asylums, cell blocks or prisons, homes for infants, aged or infirm, or any place where people are confined or are helpless, except Class E Unit Systems containing a non-irritant and non-flammable refrigerant.

Refrigerating systems installed in buildings occupied by such institutions shall be subject to the following provisions:

(a) Direct systems wholly confined to a kitchen or laboratory may be installed provided the system does not contain more than 20 lbs. of a non-irritant and non-flammable refrigerant. Such kitchen or laboratory shall be equipped with tight fitting, self closing doors and shall have natural or mechanical means of ventilation to the outside.

(b) Indirect systems containing not more than 2000 lbs. of a Class 1 non-irritant and non-flammable refrigerant may be installed provided all refrigerant containing equipment is placed in a machinery room located on the first floor or in the basement. Such machinery room shall have tight fitting, self closing doors and shall be provided with natural or mechanical means of ventilation.

(c) Indirect systems operating above atmospheric pressure containing not more than 300 lbs. of a Class 2 non-irritant and non-flammable refrigerant may be installed provided all refrigerant containing parts are placed in a machinery room located on the first floor or in the basement, as provided above.

SECTION — *Commercial Systems:* A refrigerating system assembled or installed in a building used for business or commercial purposes shall be classified as a commercial system.

Class 2 flammable refrigerants are not permitted in any installation.

Commercial systems shall be limited on the basis of occupancy and location as follows:

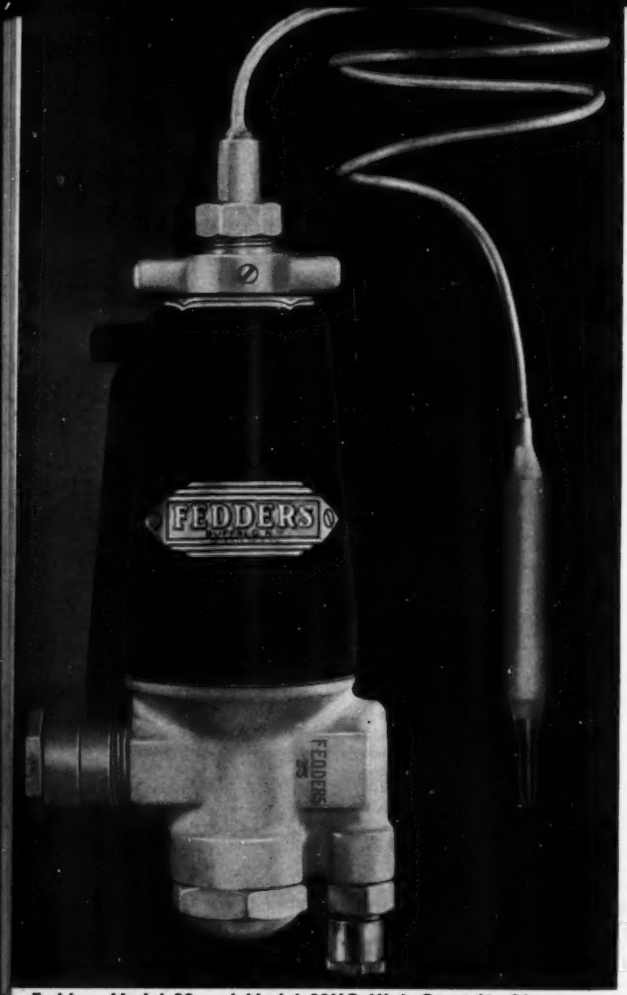
Places of Public Assembly: Refrigerating systems installed in places of public assembly, for example, auditoriums, theatres, dance halls, exhibition halls, schools (except laboratories used for teaching refrigeration), court houses, churches, entrances and exits of public buildings, entrances and exits of factory buildings with only one exit, and all similar occupancies, shall be subject to the following limitations:

(a) Unit systems containing a non-irritant or non-flammable refrigerant may be used in such locations.

(b) Direct systems wholly confined to a kitchen may be installed provided the system does not contain more than 20 lbs. of a non-irritant and non-flammable refrigerant. Such kitchen shall be equipped with tight fitting, self-closing doors and shall have natural or mechanical means of ventilation.

All other refrigeration in the above locations must be supplied by the indirect system of refrigeration except as permitted in the three Sections on Air Conditioning, with the entire refrigerant containing equipment placed in a machinery room. These systems shall be subject to the following provisions:

(a) If an irritant or Class 1 flammable refrigerant is used, system shall not contain over 500 pounds of refrigerant and entire refrigerant-containing equipment shall be placed in a machinery room devoted to no other purpose, located in the first floor or basement. This room shall be separated from other parts of building by solid construction having a four hour fire resistive value, and there



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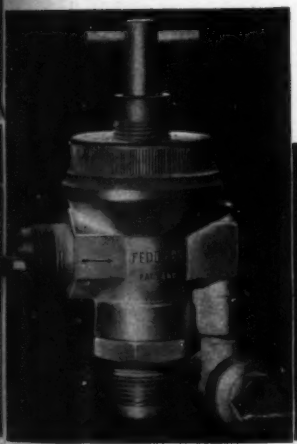

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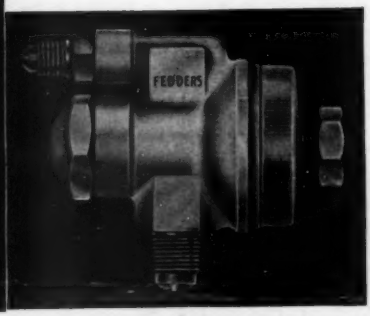
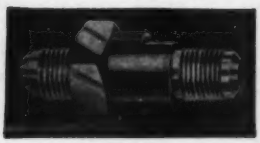
Constant Pressure
Valve



Fedders Model 9940
Automatic Expansion
Valve



Fedders Model CV-36
Check
Valve

shall be no direct means of communication between such room and any other portion of building. The entrance or exit of such room shall be located in an outside wall but not in a wall forming a part of the enclosure of an exit court.

(b) If a Class 1 or Class 2 non-irritant and non-flammable refrigerant is used the machinery room shall be provided with natural or mechanical means of ventilation directly to the outside and shall be equipped with self-closing, tight-fitting doors. Such systems when installed above the first floor shall be limited in quantity to 300 pounds of refrigerant.

Other Occupancies: Refrigerating systems installed in retail stores, restaurants, wholesale stores, beauty parlors, barber shops, offices, sales rooms, manufacturing spaces, and all similar occupancies shall be subject to the following limitations:

Direct systems of refrigeration may be installed subject to the following provisions:

(a) Systems containing a Class 1 non-irritant and non-flammable refrigerant shall be limited in refrigerant content to not more than one pound for each 100 cubic feet by volume in the total space.

(b) Systems containing a Class 2 non-irritant and non-flammable refrigerant shall be limited in refrigerant content to not more than one pound in every 50 cubic feet by volume of total space and the total refrigerant content in such systems shall not exceed 300 pounds. The compressor, condenser and shell type apparatus of systems containing more than 100 pounds shall be placed in a machinery room with natural or mechanical means of ventilation directly to the outside and shall be equipped with tight fitting, self-closing doors.

(c) Systems containing over 20 pounds of a Class 2 non-irritant and non-flammable refrigerant located where there is apparatus to produce an open flame shall be equipped with a leak alarm device that will provide a signal sufficient to attract the attention of the person or persons responsible for the operation of the system in case at any time one gallon of the refrigerant should escape from the refrigerating system, unless apparatus to produce flame is vented so as to carry all products of combustion directly to the outside.

(d) Systems containing not more than 200 pounds of irritant or Class 1 flammable refrigerant may be installed in manufacturing portions of a commercial building normally frequented by employees only, provided that where system contains over 50 pounds of refrigerant, compressor, condenser and shell type apparatus shall be placed in a machinery room with natural or mechanical ventilation and openings to other rooms be fitted with close-fitting self-closing doors.

(e) Systems containing not more than 100 pounds of irritant or Class 1 flammable refrigerant may be installed on first floor or in basement of buildings where the public is permitted, except commercial residential buildings, provided that where systems contain over 50 pounds, the compressor, condenser and shell type apparatus shall be placed in machinery room, with natural or mechanical ventilation and openings to other rooms fitted with close-fitting self-closing doors; and first floor of building shall have required exits, opening directly out of doors or through corridors or other horizontal means of exit directly to an outside exit doorway.

(f) Systems containing 50 pounds or less of irritant or Class 1 flammable refrigerant may be installed on any floor above the first floor of commercial buildings where the public is permitted, except that unit systems only may be used in retail stores, restaurants, and other locations where the number of employees serving the public exceed ten.

(g) Systems containing 50 pounds or less of an irritant or flammable refrigerant may be installed in the basement or on the first floor only of commercial residential buildings provided that the compressor, condenser and shell type apparatus of such systems containing more than 20 pounds, shall be located in the machinery room. Such machinery room shall have natural or mechanical means of ventilation and shall be fitted with tight-fitting self-closing doors.

Indirect systems may be installed in the above locations subject to the following limitations:

(a) Systems containing a non-irritant and non-flammable refrigerant may be installed in the basement or on the first floor provided all refrigerant containing parts of the system containing more than 300 pounds of refrigerant are installed in a machinery room having natural or mechanical means of ventilation. Such machinery room shall be equipped with tight-fitting self-closing doors.

(b) Systems containing 300 pounds or less of a non-irritant and non-flammable refrigerant may be installed between the first floor and the roof provided all refrigerant-containing parts of such systems are installed in a machinery room having natural or mechanical ventilation. Such machinery room shall be equipped with tight-fitting self-closing doors.

(c) Systems containing more than 300 pounds of a non-flammable and non-irritant refrigerant may be installed above the roof provided all refrigerant containing parts are located in the machinery room. All openings from such machinery room shall be made to the outside and shall not be located adjacent to the entrance or exit of any stairway, elevator shaft or fresh air intake.

(d) Systems containing an irritant or a Class 1 flammable refrigerant may be installed subject to the limitations as to quantity of refrigerant and location as required for direct systems.

(e) Indirect systems containing a flammable or irritant refrigerant in quantities greater than that permitted for direct systems may be installed, provided that they do not contain more than 500 pounds of refrigerant and further provided that all refrigerant containing parts of the system are placed in a machinery room located on the first floor or basement. Such machinery room shall be separated from other parts of the building by solid construction having four hour fire resistive value, and there shall be no direct means of communication between such room and other portions of the building.

In all other details direct and indirect systems of refrigeration must conform to the provisions contained in other sections of this code.

SECTION —. *Multiple Dwelling Systems:* No multiple dwelling system shall contain over 50 pounds of sulphur dioxide, 50 pounds of methyl chloride or 100 pounds of dichlorodifluoromethane.

No evaporator shall be placed in a sleeping room.

No evaporator shall be placed in a room having adjoining rooms, the combined cubical contents of which has less than 4000 cubic feet, and any part of which is used for sleeping purposes, unless such rooms are provided with a window, or windows, the total window area of such being not less than 10% of the floor area of such rooms. And unless such window, or windows, shall open to the outside air and be so constructed that at least one-half of such window, or windows, can be readily opened.

Shut off valves for multiple dwelling systems shall be installed at the following locations:

In the liquid and suction lines in each riser or manifold connection at or near the compressor.

At each service outlet in liquid and suction lines.

These valves shall be fitted with a hand wheel or other means of ready operation as an integral part thereof, and shall be located outside of refrigerating unit and at such distance above the floor as will provide ready accessibility.

Such valves, where located in living quarters, shall be placed in a metal box, or other suitable enclosure, and shall be rigidly attached thereto or to the supports thereof. Every such outlet box shall have an accessible door or removable cover.

Not more than one refrigerator shall be connected to one outlet box.

Every such outlet box shall be located within the premises containing the refrigerator and not within the refrigerated space.

No outlet box shall be located in any hallway, stairway or vertical shaft.

Service valves shall be installed in both connections to every multiple dwelling system evaporator of the flooded type that can be removed from the refrigerator as a unit, in such manner as to permit the removal of the evaporator with valves attached.

Every evaporator, unless constructed of material of sufficient strength to prevent injury in the ordinary and customary use thereof, shall be protected by a suitable shield to assure protection against such injury.

Every evaporator shall be firmly anchored or secured in such a manner as to make it rigid.

Every refrigerator cabinet, box, or refrigerated space, containing any evaporator, using the direct system of refrigeration shall be firmly and securely anchored and fixed to a wall, floor, or other fixed object in such manner as to hold such refrigerator box or casing securely in place.

Compressors, condensers and shell type apparatus shall be located in a machinery room provided with natural or mechanical ventilation or in an accessible part of the building not used for habitation, workshop or laundry purposes, provided that where compressors are not located in a machinery room they shall be protected by the use of heavy wire netting secured to metal posts or 2 x 4 wooden studding and shall not be located under stairways, near dumb waiter or elevator shafts.

* * * * *

SECTION —. *Air Conditioning Installations:* Refrigerating systems used for the control of temperature or humidity of air that is circulated by means of fans or blowers to space, or spaces, occupied by people, or where used for comfort cooling, shall be subject to the following requirements.

Direct systems in which the refrigerant is circulated through coils or evaporators located in the path of the air used for air conditioning may be installed subject to the following limitations:

Where a Class 1 non-irritant and non-flammable refrigerant is used the following provisions shall apply:

(a) The total refrigerant content of the system shall not exceed one pound for each 100 cubic feet of volume in total space to be cooled.

(b) Non-corroding materials shall be used in coils or permanent protection against corrosion is provided, such as galvanizing.

(c) Coils or coolers shall be tested to the test pressure specified for this refrigerant.

Where a Class 2 non-irritant and non-flammable refrigerant is used the following provisions shall apply:

(a) The refrigerant content of the system shall not exceed one pound in every 50 cubic feet of volume of total space to be cooled and the total refrigerant content shall not exceed 300 pounds.

(b) Any joint or connection in the refrigerant containing part of the system shall be threaded, welded, brazed, sweated, or of such type of construction as approved by the department.

(c) No expansion valve or connection thereto shall be located in a ventilating system.

(d) No joint or connection shall be located in air stream except connections to coil headers may be located in air stream provided such connections are welded, brazed or sweated and one and one-half times the pressure specified for this refrigerant is applied in the presence of the inspector.

(e) Coils or coolers shall be tested to one and one-half times the test pressure specified for the refrigerant.

(f) Every such refrigerating system containing over twenty pounds of refrigerant shall be provided with a leak alarm device that will produce a signal sufficient to attract the attention of the person or persons responsible for the operation of such equipment in case, at any time, one gallon of the refrigerant should escape from the system.

Where evaporators are located in apartments or hotel rooms used for sleeping purposes, or in ducts leading thereto, not more than 20 pounds of a Class 1 or 2 non-flammable and non-irritant shall be used. The evaporators of such systems shall be subject to the provisions specified above.

* * * * *

Indirect systems may be installed for air conditioning subject to the following limitations:

(a) All such systems shall be subject to the limitations for institutional occupancies, or industrial systems or commercial systems as they may apply.

(b) Apartment building installations shall not contain more than 100 pounds of dichlorodifluoromethane (Freon).

(c) Indirect systems installed in hotels shall be subject to the limitations as required for commercial systems.

(d) Liquids cooled by an irritant of flammable refrigerant shall not be used in a spray system to cool the air except in industrial or manufacturing installations.

In all other details such systems must conform to the provisions contained in other sections of this code.

SECTION —. *Unit Systems:* A system which can be removed from the user's premises without disconnecting any refrigerant containing parts and which does not contain more than 10 pounds of any refrigerant.

Such systems may be placed in any location except those prohibited in preceding sections. All unit systems shall be located in a room with adequate ventilation to the outside air, and shall have sufficient clearance around them to make them accessible.

Unit systems, unless so constructed that they will not burst due to the expansion of the refrigerant when subjected to an abnormal outside temperature, such as that created by fire, shall be protected by a pressure relief device as follows:

(a) Safety valves, if used, shall be ¼" in size.

(b) Rupture members, if used, shall have an opening at least 1/16" in diameter.

(c) Fusible plugs, if used, shall have a maximum fusing point of 200 F. and a free opening of 1/16" in diameter.

Every evaporator, unless constructed of sufficient strength to prevent injury in the ordinary and customary use thereof, shall be protected by a suitable shield to assure protection against such injury.

Every unit system shall have attached in a permanent manner, and in a conspicuous place, a metal disc or other emblem containing the following information in legible words and figures.

Maker's name.

Kind and amount of refrigerant.

Test pressures applied.

Further provisions of the Code will be concluded in the June issue.

The REFRIGERATION SERVICE ENGINEER

A Monthly Illustrated Journal, Devoted to the Interests of the Engineer Servicing Refrigeration Units, Oil Burners and other Household Equipment.

Vol. 4 May, 1936 No. 5

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Official Organ
REFRIGERATION SERVICE ENGINEERS' SOCIETY

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BUSINESS ETHICS

THERE is a definite mutuality of interests between the refrigeration service man, the parts jobber and the manufacturer. All are working toward a common objective of rendering a profitable service. All are represented by trade organizations designed to encourage ethical standards of practice and to assist in the stabilization of the business. If for no other reason than this laudable purpose, their desire for cooperative effort justifies their establishment. It cannot be denied that each is dependent on and interested in the activity of the others.

With intelligent cooperative work, each organization is in a position to help advance the industry along the lanes of good business practice, and avoid the pitfalls some other industries have experienced, and which have consequently resulted in a demoralized market for all.

Speaking for the service man, we know he is most interested in buying through legitimate channels of trade distribution where he may be assured that his interests are protected. It is apparent and gratifying that these legitimate channels of distribution have indicated a healthy growth during the past several years, and now represent a geographical network of supply stations, providing sufficient stock for the rapid service the nature of this business demands.

A considerable investment is now represented in all branches of the industry, and it is our opinion that the problems of all are recognized by each group.

UNIFORM COST ACCOUNTING SYSTEM

IN this issue is reproduced the first in a series of forms prepared by the committee on uniform cost accounting of the Refrigeration Service Engineers' Society. This form, as explained in the article which accompanies it, is the first step to assist and encourage service organizations to ascertain the cost of doing business. It is expected that such service forms and other cost accounting records which will follow will be helpful to those organizations who do not now maintain complete records to more intelligently arrive at their service costs and thus place their business house in order.

REFRIGERATION SERVICE ENGINEERS' SOCIETY

Official Announcements of the activities of the National Society and Local Chapters appear in this department as well as articles pertaining to the educational work of the Society.

THE OBJECTS OF THE SOCIETY

To further the education and elevation of its members in the art and science of refrigeration engineering; with special reference to servicing and installation of domestic and small commercial equipment; for the reading and discussion of appropriate papers and lectures; the preparation and distribution among the membership of useful and practical information concerning the design, construction, operation and servicing of refrigerating machinery.

ASSOCIATION HEADQUARTERS: 433-435 North Waller Ave., CHICAGO, ILL.

Three Chapters Apply for Charters

DURING the past month, the National Society has received formal applications from three important cities for charters as local chapters of the Refrigeration Service Engineers' Society.

The National organization welcomes the progressive service men in Washington, D. C., Indianapolis, Ind., and Buffalo, N. Y., who have identified themselves with the advancement of the profession through the facilities offered by the National organization.

CAPITAL CITY CHAPTER
Washington, D. C.

THE formal application from service men located in the Capital of the United States—Washington, D. C.—who, meeting as a group, voted to petition the National Society for a charter for the Capital City Chapter.

The Constitution and By-Laws in conformity with the National Society were adopted without change, and regular meeting dates have been established for the 1st and 3rd Thursdays of each month.

Mr. Sigmund L. Price is the Acting President until the charter is formally granted, and Mr. Chas. W. Lund is Temporary Secretary and Treasurer.

NIAGARA FRONTIER CHAPTER
Buffalo, N. Y.

After considerable effort on the part of a group of service men in Buffalo, a formal application for local charter, with the signatures of 48 names of those interested in the servicing business in Buffalo and vicinity, has been received at the National Secretary's office. At a meeting on April 2 two slates of prospective officers were nominated, and on April 15 the following officers were elected as permanent officers to take effect upon the granting of the charter by the National Society:

President—Donald B. Schuster, Liske Co., Buffalo

First Vice-President—Fred J. Cameron, Independent Refrigeration Service Co., Buffalo

Second Vice-President—George Wilson, Instructor, Buffalo Technical Institute, Buffalo

Secretary—W. S. Powell, Dayton Refrigeration Co., Buffalo

Treasurer—Ray Parsons, independent service man, Buffalo

Sergeant-at-Arms—E. J. Wiese, Buffalo Chemical Co., Buffalo

Regular meetings of this newly-formed chapter will be held on the 1st and 3rd Thursdays of each month.

INDIANAPOLIS CHAPTER
Indianapolis, Ind.

ON January 10, 1936, the service men of Indianapolis met for the purpose of forming an educational organization for the betterment and standardization of repair charges. It was decided to call this organization the "Associated Refrigeration Service Engineers." The following officers were elected: Russel Duncan, president; W. L. Drake, vice-president; R. C. Robinson, secretary; and Jerrill Cassady, treasurer.

The meetings were conducted semi-monthly and information was received from the National headquarters of the R.S.E.S. regarding the Society and its purposes. A vote was put to all the members and it was decided to ask Mr. H. T. McDermott, National Secretary of the R.S.E.S., to attend our next meeting, which was held on April 20. On that date twenty-two men assembled for the regular meeting at F. H. Langsenkamp Company, 229 East South Street, Indianapolis. The meeting was turned over to Mr. McDermott, who explained the purposes of the Society and its benefits and answered all queries. A motion was introduced that we make application for a charter, and May 18 was set as our charter night.

A short lecture on refrigeration coils was given by Mr. Harry Lindsey of the Peerless Ice Machine Company.

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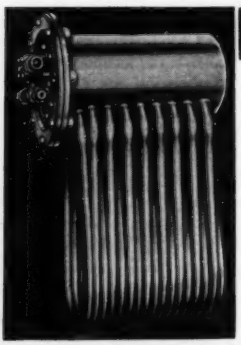

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Entertainment Committee Promises "Big Doings in Memphis"

MEET the members of the Entertainment Committee of the Memphis Chapter, R.S.E.S.

These gentlemen play an important part in making the 1936 convention a success.

Mr. Bruce Hale, chairman, says, "I would like to take this opportunity to express to the members of the Finance Committee our appreciation for the very liberal manner in which they met every request we made of them for financial aid.

"I would also like the entire membership to know how much assistance the Ladies' Committee has been to the Committee in planning and arranging details of the various events to be held during the 1936 convention. It is entirely due to their efforts that we are able to give you a complete outline of entertainment activities at this time."

The National Convention opens on Armistice Day, November 11. This day is in itself a big and gala event in Memphis. During the morning, there are parades and a regular carnival spirit prevails. The National Convention will convene, and at that time we open our entertainment with a "Bingo Party," with prizes for everyone. After the National Convention recesses, it will be one busy time. At 9 p.m., we have chartered the "Colonade," Memphis' most exclusive night club. We will have dancing, floor show, novelties, and everything to have a good time until the small hours of the morning.

Thursday, November 12, 1936

On the second day, we plan to start our day with a bus tour of the city and cotton industry, after which the convention will reconvene. During this time there will be a big "Afternoon Party" for the ladies until 4

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MEMBERS OF MEMPHIS CONVENTION ENTERTAINMENT COMMITTEE

p. m., at which time we have our "Amateur" program with participants from every chapter competing for prizes. First prize $15.00, Second prize $10,00, and Third prize $5.00. The banquet will begin at 8:30, and will continue until 11:30. We have chartered the

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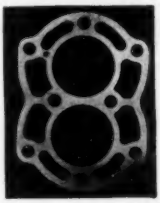

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Friday, November 13, 1936

By this time we feel you will realize that you have been to an outstanding convention and, as the National Convention reconvenes, the ladies will be entertained for luncheon. Friday night is general get-together evening, bidding fond adieu to many newly-made friends until we meet again.

Consider all of this entertainment that the 1936 convention will offer to all of the conventionites, and at the nominal cost of the registration fee of $2.00 per person. Remember this includes everything—banquet, entertainment, admission to all of the events, tours of the city, etc. Memphis is planning on an attendance of 1,000. All of the committees are working hard to make this convention the biggest ever held in the refrigeration industry. All we need to make it the success we hope for is your cooperation.

You can cooperate by talking to your friends and deciding now to lend your support "by your personal attendance."

Attend the Third National Convention to be held in Memphis, November 11, 12 and 13, and enjoy "real southern hospitality."

Next month the Ladies' Committee will report the results of their efforts in behalf of the entertainment of the visiting ladies.

60% of Exhibit Space for Convention Sold

ONE of the most important features of the forthcoming convention of the Refrigeration Service Engineers' Society in Memphis, Tenn., November 11, 12 and 13, is the manufacturers' exhibit. This exhibit is an important part of the educational program of the national convention.

The manufacturers' exhibits present an educational story in the development and refinements embodied in the production and

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COMPLETE STOCK QUICK SERVICE

No matter what parts, supplies or tools you may need for any type of refrigerator or air conditioner, our COMPLETE LINE can meet your requirements promptly. All QUALITY MERCHANDISE. Deal with Airo; you can rely on getting exactly what you order. Airo prices are lowest wholesale prices obtainable. Orders are shipped the same day received. WRITE FOR NEW, COMPLETE CATALOG. It's FREE.

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AIRO SUPPLY COMPANY 408-10 N. Wells St. Chicago, Ill.

For INSTALLATION and SERVICE
of REFRIGERATION AIR CONDITIONING and OIL BURNER Equipment

THERMOSTATS
GAUGES
BELTS
GASKETS
EXPANSION VALVES
CONTROLS
TOOLS
FITTINGS
TUBING
REFRIGERANTS
COOLING COILS

Large and complete stock. Quick delivery. Catalogs on request.

M & E Refrigeration Accessories Co.
Refrigeration and Oil Burner Supplies
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COILS
CATALOG NO 101

READY NOW
OUR NEW
CATALOGUE
WRITE FOR IT AT ONCE!

REMPE "FIN COIL" COMPANY
340 N. Sacramento Blvd. Chicago, Ill.

RANCOSTAT
The Stainless Steel Thermostat

Replace with Rancostat. It's the sure way, the safe way, the quick way. Sturdily built of Stainless Steel. Fewer parts—machined to close precision limits. 30 Replacement Models. Write for new Bulletin—No. 655.

The Automatic Reclosing Circuit Breaker Co.
Columbus, Ohio

Q.-A. REPLACEMENT PARTS

Toggle Shelf Hooks, Rubber Shelf Buttons, Cross Bars, Cross Bar Brackets, Tray Fronts, Clamps, Bushings, Universal Mounting Brackets, Etc.

I specialize in parts for "ORPHAN REFRIGERATORS"

A postal will bring Bulletin #801

Colman J. Mullin, 52 Church St., N. Y. City

Condensing Unit
Style D7-MA

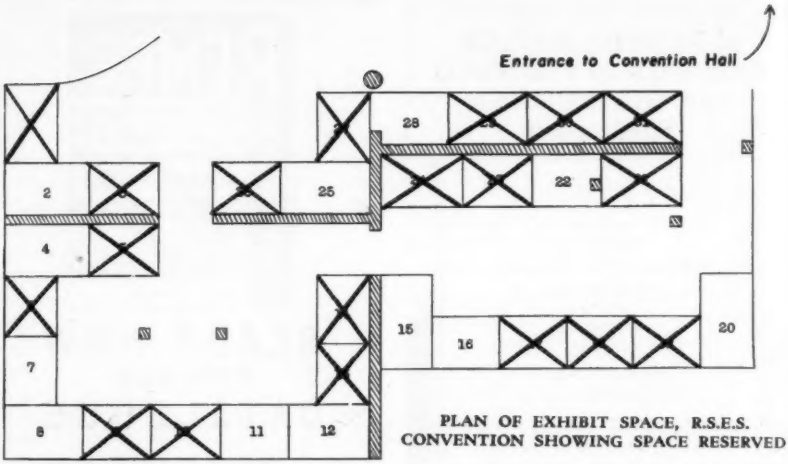
STARR FREEZE

DEPENDABLE COMPRESSORS AND CONDENSING UNITS
1-2-4 Cylinders—⅛ to 10 H.P.

The most profitable and complete line to select from—just the size to build that refrigerator,—to assemble that condensing unit or to replace that old worn-out compressor.

Compressor
Style J

THE STARR COMPANY, Richmond, Ind., U. S. A.
REFRIGERATION SINCE 1927 — **or 222 North Vermont Avenue Los Angeles, Calif.** — ESTABLISHED IN 1872



PLAN OF EXHIBIT SPACE, R.S.E.S. CONVENTION SHOWING SPACE RESERVED

operation of refrigerating equipment and accessories.

Although the announcement of the available exhibit space has been released only a short time, already more than 60% of the exhibit space has been reserved. The following companies have thus far made exhibit reservations:

Fedders Manufacturing Co., Buffalo, N. Y.
Ranco, Columbus, Ohio.
Cutler-Hammer, Inc., Milwaukee, Wisc.
Dole Refrigerating Co., Chicago, Ill.
Perfection Parts Co., Harvey, Ill.
American Injector Co., Detroit, Mich.
Rotary Seal Co., Chicago, Ill.
The Starr Co., Richmond, Ind.
Standard Refrigeration Parts Co., Chicago, Ill.
Automatic Products Co., Milwaukee, Wisc.
Ansul Chemical Co., Marinette, Wisc.
Airo Supply Co., Chicago, Ill.
Mueller Brass Co., Port Huron, Mich.
Wolverine Tube Co., Detroit, Mich.
Alco Valve Co., St. Louis, Mo.
Curtis Refrigerating Machine Co., St. Louis, Mo.
Detroit Lubricator Co., Detroit, Mich.
Imperial Brass Mfg. Co., Chicago, Ill.
Mills Novelty Co., Chicago, Ill.
Kerotest Mfg. Co., Pittsburgh, Pa.

The diagram shows the arrangement of the exhibit space, and indicates the space still available.

PITTSBURGH CHAPTER

Meeting of April 13, 1936

By F. V. GOLITZ, *Secretary*
1518 Davis Avenue, Pittsburgh, Pa.

THE regular meeting of Pittsburgh Chapter was held on April 13 in the Roof Garden of the Mayfair Hotel, President C. O. McCauley presiding. Approximately sixty members, friends and visitors were in attendance.

The Secretary read the minutes of the March meeting and they were accepted as read. The attention of the Secretary was called to an error in the report of the election held in February. In reporting the election of the Board of Directors, the name of Wesley Barnes was inadvertently substituted for that of S. A. Ricci. The Secretary apologized to Mr. Ricci for the error and notified Mr. Barnes of the change. The Secretary reported that the special meeting scheduled for March 28 could not be held due to the flood situation, as on that date none were being admitted to the downtown district except on special pass. Naturally, this prevented the holding of a meeting anywhere in the downtown district. The Corporation Room meeting place was completely filled with water and will require replastering, repainting, reflooring and new furniture before being in condition for use as a meet-

NEW FREE REFRIGERATION CATALOG

Thousands of replacement parts for practically every standard make of Refrigerator at *lowest WHOLESALE Prices* — as well as a line of Refrigerators incorporating the latest features and priced so that Servicemen can make a profit!

Gaskets, tubing, thermostats, evaporators, tools, and hundreds of other items are listed. No matter what you want in the Refrigeration Field we can supply it *when* you need it and at a price that will enable you to make a legitimate profit.

Get your Free Copy of this new Specialized Refrigeration Catalog.

WHOLESALE RADIO SERVICE CO., INC.
901 W. Jackson Blvd., Dept. E30F
Chicago, Ill.

Please send me your Free Specialized Refrigeration Catalog.

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Address .....

City ..... State .....

WHOLESALE RADIO SERVICE CO.
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CHICAGO, ILL.
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ATLANTA, GA.
430 W PEACHTREE ST NW
BRONX, N.Y.
542 E FORDHAM RD
NEWARK, N.J.
213 CENTRAL AVE

THE ANSUL TWINS WIN AGAIN

When you put your money on the Ansul Twins you back consistent winners. They return in quality and performance every dollar you invest in them.

ANSUL CHEMICAL COMPANY
MARINETTE WISCONSIN

ing place. The room in the Crafts Building was also damaged by flood waters. This necessitated the renting of the Roof Garden for the April meeting.

Mr. McCauley introduced Mr. C. A. Augustine of the Brown Dorrance Company, Grunow distributors. Mr. Augustine gave a lecture on Grunow and answered the questions asked at the end of the lecture. In behalf of the assembly, Mr. McCauley thanked Mr. Augustine for his splendid, informative talk.

Mr. McCauley reported that one of the largest distributors in this district had offered to cooperate in furnishing the chapter a schedule of minimum service prices recommended by his organization. This will be reported in detail at the May meeting.

The President appointed the following committees: Finance Committee, chairman, S. A. Ricci; Entertainment Committee: V. C. Waight, Paul Templin, G. W. Gunnell and Albert H. Ross. The Entertainment Committee was instructed to arrange for a stag party to be held within two weeks.

After much discussion of means of increasing the membership, credit bureau, minimum prices and payment of dues, the meeting was adjourned.

Cost Accounting System

National Society Prepares Uniform Service Order Form

Cost Accounting Committee Prepares Uniform Service Form Combining Many Essential Features for Servicing Business Forms Sold to Members at Nominal Charge, Imprinted with Name.

By HARRY DROWNES, Chicago
Member National Cost Accounting Committee, R.S.E.S.

A REFRIGERATION engineer is primarily interested in the installation and service of refrigerating devices. He is not interested in becoming a bookkeeper. For this reason the National Committee on Cost Accounting found it necessary to reject elaborate cost systems which were presented prior to the last convention.

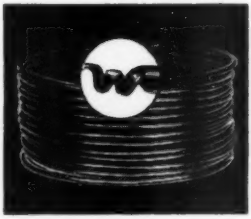
The value of cost finding in any business cannot be denied. We unconsciously admit this value when we make an estimate, because in our estimate we *guess* at our *probable costs* and then add a percentage for profit. In a cost system, we know our *actual cost, our actual revenue* and the difference is our gross profit or loss. As a matter of fact, large concerns can afford to have estimating departments and cost accountants place their estimate on one side of a sheet of paper, and the cost accountant accumulates the costs on the reverse side. In this manner the executive can readily determine individual costs, as well as checking on his estimating department.

It is our purpose to present a cost system adaptable in simplicity for the "one man shop" operator, yet sufficiently expansive to dovetail into more elaborate records when this "one man shop" operator becomes an operator with an organization.

It must be borne in mind that a cost system, the same as any kind of an accounting system, is merely an orderly systematic recording of every-day occurrences in a business, in such a manner that all information is quickly accessible when needed. This is accomplished through alphabetical filings, the use of numbers in sequence, etc.

Let it be distinctly understood that it is not our idea to promote any kind of an accounting system such as single entry or double entry bookkeeping, the use of general

HERE'S THE TUBING THAT HANDLES EASILY



By a special bright annealing process Wolverine Refrigeration Tubing is produced with an unusually soft uniform temper that makes handling a pleasure. It is easy to bend, cut or flare and can be threaded through walls or over rafters "with the greatest of ease."

Insist on Wolverine (the name is stamped on every foot) Refrigeration Tubing and save your time on the job.

WOLVERINE TUBE CO.

SEAMLESS COPPER BRASS & ALUMINUM

DETROIT MICHIGAN

1411 Central Ave. Detroit

NEW LOW PRICE

V-METH-L

5 cents less a pound—new reduced price of V-METH-L (Virginia Methyl Chloride) now in effect.

V-METH-L is the finest quality methyl chloride available—delivered to you promptly from 69 distributing points. In cylinders of various sizes for your convenience and economy.

EXTRA DRY ESOTOO (liquid sulphur dioxide) of similar high quality delivered with similar promptness.

Virginia Smelting Co.
West Norfolk, Virginia

F. A. EUSTIS, Sec'y, RSE-5-36
VIRGINIA SMELTING CO.,
131 State St., Boston, Mass.

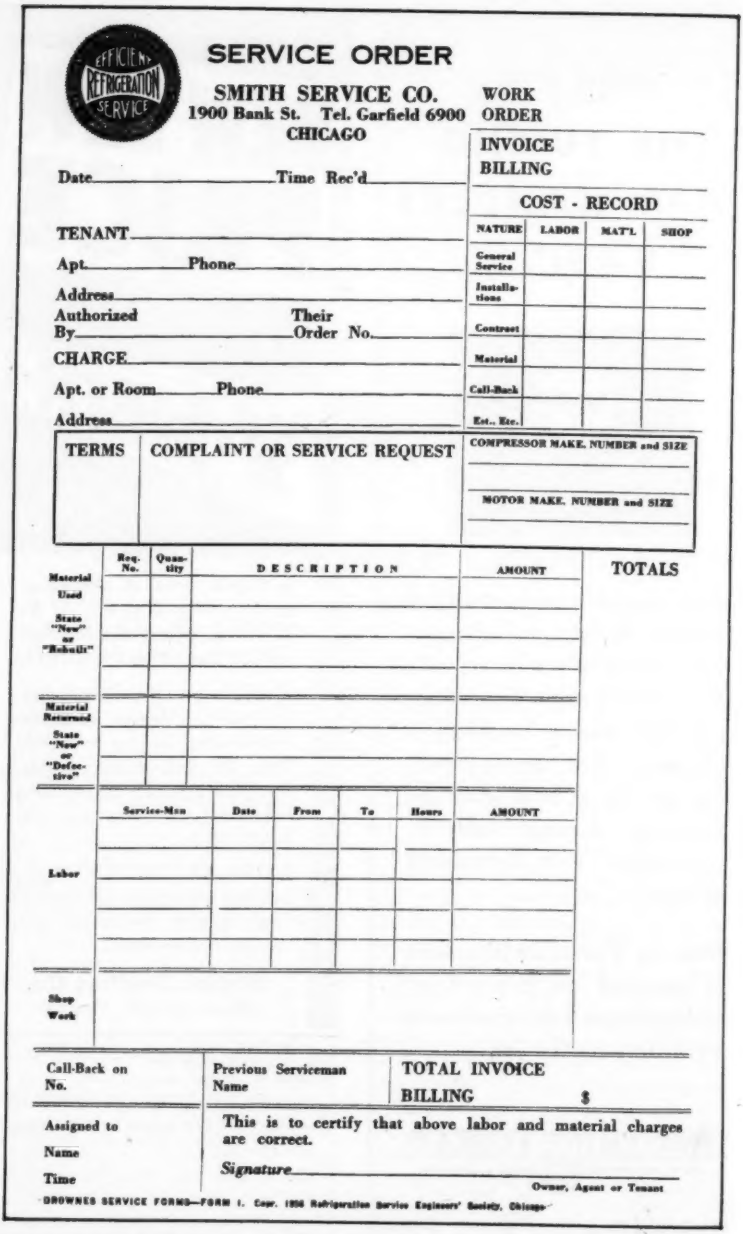
I am interested in receiving any literature you may issue from time to time on

☐ Extra Dry ESOTOO (Liquid Sulphur Dioxide)
☐ V-METH-L (Virginia Methyl Chloride)

Name .....

Street and No. .....

City and State.....



SERVICE ORDER

SMITH SERVICE CO.
1900 Bank St. Tel. Garfield 6900
CHICAGO

WORK ORDER

INVOICE
BILLING

Date _____ Time Rec'd _____

TENANT _____

Apt. _____ Phone _____

Address _____

Authorized By _____ Their Order No. _____

CHARGE _____

Apt. or Room _____ Phone _____

Address _____

COST - RECORD

NATURE	LABOR	MAT'L	SHOP
General Service			
Installations			
Contract			
Material			
Call-Back			
Est., Etc.			

TERMS	COMPLAINT OR SERVICE REQUEST	COMPRESSOR MAKE, NUMBER and SIZE MOTOR MAKE, NUMBER and SIZE

	Req. No.	Quantity	DESCRIPTION	AMOUNT
Material Used				
State "New" or "Rebuilt"				
Material Returned				
State "New" or "Defective"				

TOTALS

	Service-Man	Date	From	To	Hours	AMOUNT
Labor						
Shop Work						

Call-Back on No.

Previous Serviceman Name

TOTAL INVOICE BILLING $

Assigned to

Name

Time

This is to certify that above labor and material charges are correct.

Signature _____
Owner, Agent or Tenant

BROWNES SERVICE FORMS—FORM 1. Copr. 1936 Refrigeration Service Engineers' Society, Chicago

FIG. 1. SERVICE ORDER FORM PREPARED BY R.S.E.S. ACCOUNTING COMMITTEE

DETAILED WORK SHEET

State briefly "Actual Existing Complaint" and mention if different from original complaint:

OPERATION	FOUND	LEFT
Head Pressure		
Suction Pressure		
Switch Cut In		
Switch Cut Out		
Cold Control Cut In		
Cold Control Cut Out		
On Cycle		
Off Cycle		
Box Temp.		
Ice Comp. Temp.		

WORK DONE

CALL DATE	Each call must be shown and dates must correspond with dates shown on reverse side.

Was Job O. K. when finished?_____

If not give reason:_____

Signature of Service Man_____

FIG. 2. REVERSE SIDE OF R.S.E.S. SERVICE FORM

ledgers, etc., but we are confining our efforts to a cost form and possibly some forms to accumulate these costs.

This now brings us to the indispensable "service form" which form we propose to make a combination service form and cost record. A copy of this form is reproduced in Figs. 1 and 2. (These forms are copyrighted by the National Society.) The form is absolutely self-explanatory. There is absolutely nothing in this form which an operator cannot understand. It goes through the following circle:

(1) Order is taken. Address of location of equipment is shown. Name and address of landlord or agent is shown. Terms—Charge or cash are indicated. The original complaint is shown.

(2) The assignment is made to the service man (lower left hand corner).

(3) Service man does his work and makes his report. On one side he shows labor and material used. On the other side a technical report briefly outlining the actual condition found and the actual work done.

(4) Space is provided for shop work.

(5) Billing is made of labor material and shop work.

(6) Actual cost of this same labor, material and shop work is shown in space provided.

(7) Billing is accumulated in sales book, and at the same time costs are accumulated.

The difference between *sales* and *labor material and shop work costs* represents gross profit.

Advantages to Be Derived from Use of "Service Form"

(a) If every number is accounted for *no charges can be lost.*

(b) Gives a permanent history of case, which becomes invaluable in call backs.

(c) Accounts for every productive hour.

(d) Accounts for all material used on every job.

(e) Has provisions to show the cost of this labor and material.

(f) Can be used for service, estimating, installation or call backs.

(g) Shows cost of estimates and miscellaneous expense in field.

(h) Shows cost of call backs.

(i) Shows billing to customer and, *although not recommended,* one copy (where duplicates are used) can be given to customer.

(j) Where billing is made on a regular invoice (*which we recommend on charge accounts*), space is provided to show invoice number.

(k) Provides space for signature of tenant.

(l) Each sheet shows the *GROSS PROFIT* figures. The gross profit is obtained by adding the LABOR, MATERIAL and SHOP OVERHAUL and deducting this amount from the invoice billing.

(m) To obtain the same results for a month's business, any multicolumn form can be used to accumulate these same figures from all completed service form tickets.

(n) The payroll can be likewise accumulated from these tickets.

(o) The material can be accumulated from these tickets and thus serve as a check against the inventory, and will bring to attention that material is either not being charged or is being stolen.

(p) The specific check-up showing CONDITION FOUND and CONDITION LEFT enables supervisors to determine whether job was repaired according to accepted theories and practices.

Additional Forms

The service form alone becomes inadequate, especially after an organization grows larger. In subsequent issues we will show

C.O.D. Receipt Forms to be given instead of invoices.

Material Requisitions to be used every time stock is issued to service man.

Shop Tickets to be used on every job brought into shop for overhaul.

Invoice Forms to be used for charge billing.

Cost Sheets to accumulate billing and costs.

Service Control Sheets to keep track of daily calls.

No other forms are contemplated, inasmuch as this is not supposed to be a bookkeeping course. If the business grows, naturally a bookkeeper must be employed, and

HEALTH GUARD FUME KIT

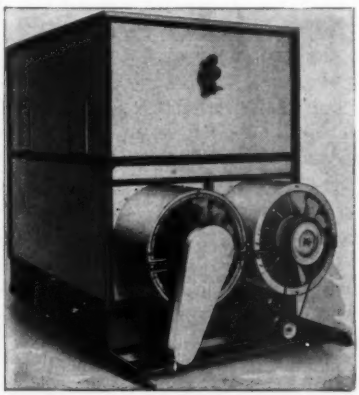
for
REFRIGERATOR
SERVICEMEN

Affords ample protection against ammonia, sulphur dioxide and methyl chloride fumes in the concentrations usually encountered. Makes work safe, even when confronting a bad gas leak—avoids a peck of trouble—pays for itself the first time it's needed. Convenient, comfortable to wear, tested quality construction. Should go along on every job!

Write for Complete Details

CHICAGO EYE SHIELD CO.
2341 Warren Blvd. CHICAGO, ILL.

BINKS SPRAY COOLING TOWERS
Indoor Forced Draft Type Will *Save Money for You!*



What happens to the circulating water after it passes through your Ice Machine Condensers?

If discharged to waste you are literally pouring good hard earned dollars down the sewer! Check your water bills . . . see how much you are throwing away. You'll be surprised.

A Binks Cooling Tower permits the constant recirculation of the required supply, cooling and using it over and over again and again, substituting a small pumping charge for the former heavy water bills.

There are more than three thousand Binks Cooling Towers now in operation including sizes for all standard commercial refrigeration units. Let us tell you more about it, and how YOU TOO can cut the water costs of your present equipment by as much as eighty per cent.

Write Today for Bulletin No. 70

BINKS MANUFACTURING CO.
3151 Carroll Ave. Windsor, Ontario-Canada CHICAGO, ILL.

the average bookkeeper will be able to dovetail these records into the general figures.

Service Control Sheet

It is optional whether a service control sheet is made before the service orders are written or if the service orders are written first and then copied to the control sheet. We will explain this form, after which the reader can draw one on any sheet of paper. In a future issue we will suggest a printed form for this purpose.

The primary purpose of the control sheet is a quick, ready reference on all jobs, and the service man to whom these jobs are assigned. It usually outlives its usefulness in a week's time, during which time, however, it is invaluable when any question comes up about a partially completed job, or a call back. A suggested service form is illustrated in Fig. 3.

SERVICE CONTROL SHEET

Date.....

Service No.	Invoice no.	Location of Equipment		Serv. Man	Landlord or Agt.	Remarks
		Name	Address			
1						
2						
3						
4						

FIG. 3. SUGGESTED SERVICE CONTROL FORM

The service numbers should agree with the service numbers on the service form.

The invoice number is not filled in until the service form has been regularly billed, at which time the invoice number is written in. In this manner it can be easily and readily determined which service forms have not been billed as the unbilled ones will bear *NO INVOICE NUMBER.*

Most calls come over the telephone. At the time the call is received the address and other information is written on the service control. When the service man (who has a book of service forms with him) comes into the shop, or calls up for assignments, these calls are relayed, and the control sheet is marked accordingly. When the service call is completed the service man turns in his service form, which is billed, and the billing information is put on the control sheet. After which, in a fashion, the control sheet has lost its value, unless a call back arises, in which case the scanning of possibly two or three sheets of paper reveals the service number, from which information the original service form can be located.

Another way to handle incoming calls is as follows: As soon as the complaint comes in the service form is made in duplicate, the duplicate being retained by the office and the original issued to the service man when he comes into the office. Under this plan the service man must have a book of field service forms to take care of phone calls relayed to him in the field, which form, properly filled out, is pasted to the original service form at the time he turns it in.

Some prefer one way, some the other. The writer prefers the latter system, as the duplicate sheet in the office serves as a complete record for notations on incompleted or troublesome jobs, selling notations, costs of special material, etc.

Prices

This service form is copyrighted by the Refrigeration Service Engineers' Society. Quantity production permits the sale to members of the Society at a low cost.

The service form is published in books of fifty forms each, printed on white stock, trimmed to 5½ in. wide by 11 in. high.

500 original forms—or ten books—with name, address and telephone number imprinted as ordered, postage paid....$8.85
Larger quantities proportionately lower.

Send Today for New

BORG-WARNER CATALOG

Free for the Asking

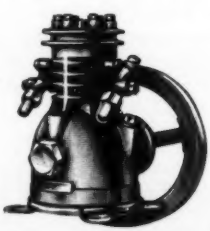
Stocks
Always Complete
Shipments
Prompt
Full
Cooperation

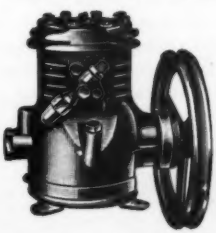
Your time and money saving guide to DEPENDABLE PARTS and ACCESSORIES for all makes of Refrigerators and Air Conditioning Units.

Every part and accessory has the backing of Borg-Warner's world wide reputation for uniform high quality, dependability and accuracy.

BORG WARNER SERVICE PARTS CO.
DIVISION BORG-WARNER CORPORATION
2100 Indiana Avenue, Chicago, Ill.

"Chieftain" Quality Built Compressors and Condensing Units





See Your Jobber
For Literature and Prices on Our Complete Line

Save money by installing "Chieftain" Compressors instead of trying to satisfy exacting customers with rebuilt compressors or condensing units.

"Chieftain" Compressors are made to last. Precision limits are maintained on all parts. Our new and exclusive lubrication system insures longer life and higher efficiency, as well as a quiet operating unit.

In addition to quality we offer prices that will permit you to make a higher percentage of profit as well as a saving of time, which will enable you to satisfactorily handle a larger volume of business.

TECUMSEH PRODUCTS COMPANY, Tecumseh, Michigan
Refrigeration Division

If it is desired to secure the books of service forms in originals and duplicates—the original on white stock and the duplicate on colored stock—twenty-five original and twenty-five duplicate forms to each book—the above prices will prevail.

The foregoing is a very brief outline, and we realize does not cover the entire scope of the subject. It may give rise to many inquiries. These inquiries are not only welcome but are solicited, and will be answered through the official organ of the society. Address all communications to:

HARRY DROWNES,
R. S. E. S. National Cost Accounting Committee.
433 N. Waller Ave.,
Chicago.

Third Annual Chicago Chapter Banquet Huge Success

IT'S past history now, but the memories of an eventful evening will long be remembered.

The Stevens Hotel on Saturday evening, April 18, was the scene of the joyous occasion. It was an evening replete with the spirit of good fellowship. Crowded into the delightful surroundings of the North Ball Room some 250 people assembled to partake of a sumptuous banquet, to witness the excellent floor show provided and enjoy dancing until "going home time."

The Third Annual Banquet accomplished a two-fold purpose. It provided an evening for a real get-together of the members, their families and manufacturers' and jobbers' representatives, as well as adding to the financial strength of the Chapter to carry forth its educational activities for the balance of the year.

An advertising program of 32 pages, 6" x 9" in size, splendidly supported by the manufacturers and jobbers, contributed much to the financial success of the affair.

* * *

"THE 'CONTRIBS' COLYUM"

By THE KINGFISH

WELL! Well! Well! The big banquet of Chicago Chapter went off with a bang and was one of the greatest affairs ever staged by the R.S.E.S. and the greatest affair undertaken by any individual chapter, and, further, it was a success, with a capital "S."

There were people there from far and near, and they dined, wined, danced, and talked, and made merry to the extent of some $1,000.00 at the world's largest hotel,

GROUP PICTURE CHICAGO CHAPTER ANNUAL BANQUET

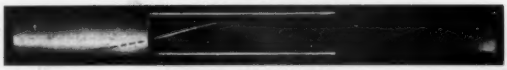
MILLS

COMPRESSORS

for Commercial Use

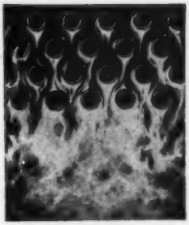
Mills Novelty Co. • 4100 Fullerton Ave. • Chicago, Ill.

KRAMER REFRIGERATING EQUIPMENT FEATURING



INNER SWIRL FIN

Have you received copy of your catalog No. 336?



STAGGERED TUBES

These two factors together with SOLID FINS, ELECTRO TIN FINISH and ALL-COPPER Construction make KRAMER LOW-SIDE EQUIPMENT the leaders in extended surface for 1936.

TRENTON AUTO RADIATOR WORKS

210 West 65th, N. Y. C. TRENTON, N. J. 5114 Liberty Ave., Pittsburgh, Pa.

INFORMAL "CANDID CAMERA" SHOTS AT CHICAGO BANQUET

FIRST ROW. Ivar Skipple exhibits a prize winning drawing to an interested group. The Imperial Brass Group. SECOND ROW. Messrs. Polley, Duval, Ramclow and Reed of Mills Novelty. Two of the pioneer Chicago service men, Charles Cappel, Harry Alter Co. and Geo. Monjian, George Monjian Co., President Paul Jacobsen and Harry Busby find a moment for relaxation. THIRD ROW. Messrs. Jacobsen, Heide, Monjian and Nickerson indulge in pleasantries. The Ranco group. FOURTH ROW. The Minneapolis-Honeywell field engineers enjoy the good fellowship. A group of Chicago Chapter members and their wives watch the activities.

The Stevens on Michigan Blvd. We must give the hotel credit for the wonderful dinner and the excellent service.

The inner man was amply replenished with fresh New Orleans shrimp cocktail, beef consommé, appetizers, supreme of spring chicken

A practical low-priced oven

For Refrigeration Service Shops and Distributors . . .

Here is the oven you service men and refrigerator distributors really want—an oven that is practical for the service shop and a standard oven that is really low priced.

Put a Despatch Type C Oven in your service shop. Use it for dehydrating your refrigerator units. Marvel at the uniform and positive results you get in such a short time and with such low costs.

Then use it for baking and drying your finishes. It will do a fine job and your customers will certainly be pleased too.

Now use it for baking and drying insulating varnishes on coils and armatures, and for other odd jobs that always come up around the service shop.

Despatch Type C Ovens are general utility ovens and that makes them of such outstanding value to any distributor and service man.

And the prices are the lowest for a standard service station oven. Equipped with gas or electric heating systems, and made in every size to meet individual requirements, these ovens range in price from $48.00 up. Prices asked for these ovens only represent a fraction of their real worth. Standard ovens can be shipped immediately from stock.

WRITE TODAY for bulletin illustrating these ovens and outlining the remarkable low prices. Tell us about your problem too—Despatch can help you.

DESPATCH OVEN CO.

632 Ninth St., S. E. **Minneapolis, Minn.**

REFRIGERATION TOOLS by TOOL SPECIALISTS
Bonney—after an extensive study of the refrigeration industry, has developed a complete line of tools for refrigeration maintenance work. When you buy Bonney Tools you can depend on it that you are buying the correct tools to do the job.
Your jobber has Bonney Refrigeration Tools, or write for Bulletin CV43 describing the entire line.
BONNEY TOOLS
DEPT. R
BONNEY FORGE & TOOL WORKS
Allentown, Pa.

Member Refrigeration Supplies & Parts Manufacturers Association

with creamed mushroom sauce, potatoes and fresh green peas, Palm Beach salad, tutti-frutti ice cream, and petit fours, topped off with coffee. Everything was delicious and far superior to the average restaurant food.

Of course, a large banquet picture was taken and you can judge for yourself as to whether we enjoyed ourselves or not. Besides the large picture, we also had our candid camera man working. This man, whose work you have often had the opportunity to see, but whose name you probably seldom hear, is Vernon Smith, the very excellent photographer of Nickerson & Collins Co. Some 24 candid shots were taken, and he caught nearly all the celebrities present, with the exception of those who were crowded in so he could not get to them, and some dandy shots resulted.

Among Those Present

There were such well-known people present as "The Grand Old Man," Mr. J. F. Nickerson, publisher of our official organ and founder of the R.S.E.S.; National President Paul Jacobsen and wife; National Secretary H. T. McDermott; the Kingfish and his better half; our eminent Chicago Chapter Secretary, Harry Busby, and his better half; Mr. and Mrs. George Monjian, Mr. Charles Cappels of the Harry Alter Co., Mr. and Mrs. Oscar Heide, the Roth family, Mr. R. Vanston, president of the Service Fitters' Union, Local 597, with Mrs. Vanston; Mr. Harry Armstrong, secretary of the same organization, with Mrs. Armstrong, and Business Representative Hogan and several others.

Of course, the Goldberg family was present in a body and, according to the pictures, had a fine time; also, Mr. Harry Drownes, the busy ticket committee chairman, with his wife. The Ranco people had their representatives come up from Columbus, and the field engineers from Minneapolis-Honeywell were also there in person. Mr. and Mrs. Warren Mills of our efficient program committee; representatives from the H. Channon Co.; Anaconda Copper and Brass Co.; Mr. James O'Connor, assistant to the service manager of Grunow; Messrs. Ray Polley, Smith and Duval from Mills Novelty Co.; the DeGans from Park Ridge; Hans Jensen; Walter Meyer, and some of their associates from Rotary Seal, and, of course, the Imperial Brass Co. had their gang present, including Messrs. McNellis, Frank, Benson, etc.

Then there was our first Vice-President of Chicago Chapter, Mr. Ivar Skipple, with his wife; Mr. and Mrs. C. E. Hamilton from Airo Supply Co. and Mr. R. L. Hendrickson of U.E.I. And, don't forget that good crowd of fellows from Rex Refrigeration, Mr. Lindquist from Gates Rubber Co., Mr. Girard from Chemical Distributors, and Mrs. Neil Browne of the B-Line Parts Co., one of the few companies operated by a woman.

Unfortunately, space does not permit me to mention all the people, but they were there, we can assure you of that. Wonderful music and entertainment were provided, and the dance floor was at times so crowded that it was next to impossible to turn around, or to move in any direction. Some 250 people were present and were entertained until about 1 A.M., and after that a great number went to other places before going home.

Banquet Program

We must say that the program presented to everybody was well laid out and in it were advertisements from every branch of the industry, showing where you can buy anything from a belt to a complete refrigeration plant. Fifty-two different companies were represented in all.

On the inside back cover, the Chicago Chapter extended a cordial invitation to all chapters to consider its facilities for the 1937 convention, and closes with the slogan, "We all will be seeing you in Memphis, November 11, 12, 13."

May there be many parties like this one in the various parts of the country, and the R.S.E.S. will be going places rapidly.

KANSAS CITY CHAPTER

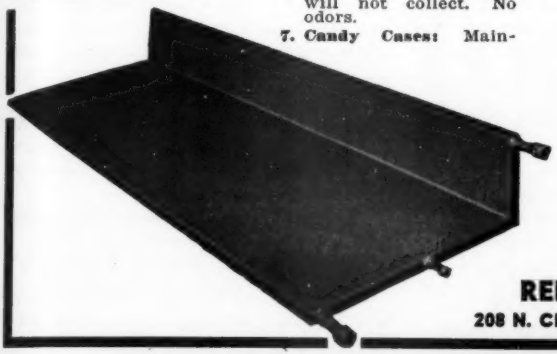
Meeting of March 10, 1936

By **R. E. KINGSOLVER**, *Secretary*
2212 E. 38th St., Kansas City, Mo.

THE meeting was called to order by President Cox. Roll call of officers followed listing H. F. Andrews, Mr. Ramey and Mr. Ransdell as absent. Roll call of members followed. The minutes of the last regular

11 APPLICATIONS FOR DOLECO PATENTED VACUUM COLD PLATES

1. **Walk-in Coolers:** Maintain exceptionally low temperatures. Efficient, clean and sanitary.
2. **Display Cases and Counters:** Plate serves as shelf for products. Cooling from below.
3. **Beer Coolers:** For precoolers and boxes. Clean, sanitary. Requires little space.
4. **Milk Coolers:** Efficient. Require little cabinet space, allowing greater milk storage.
5. **Bottle Coolers:** Economy of space permits more bottles. Maintains even temperatures.
6. **Water Coolers:** Compact plates give more space for water. Slimes will not collect. No odors.
7. **Candy Cases:** Maintains proper temperatures. Very efficient. Very slight frost accumulation.
8. **Cheese and Butter:** Plates form shelves for product. Product in close contact with plates.
9. **Ice Cream Cabinets:** Standard conversion units available. Maintains low temperatures with high efficiency. Greater ice cream capacity in cabinet.
10. **Trucks:** Desired temperatures with Hold-Over Efficiency.
11. **Domestic Evaporators:** Standard 2, 3, 4, and 5 tray sizes. Enamel fronts and doors. Defrosting minimized. Efficient.

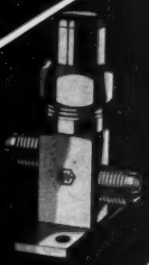


WRITE FOR BULLETIN P

DOLE
REFRIGERATING CO.
208 N. CLINTON STREET, CHICAGO

Valvize with

- Valves for easy installation on all refrigeration lines.
- Modernly made from extruded brass rod.
- Send for our catalog of Refrigeration Valves and Fittings and name of your nearest distributor.



Weatherhead

The WEATHERHEAD *Company*

620 714 FRANKFORT AVE. • CLEVELAND, OHIO

meeting were read and approved.

The following new applications were presented: Messrs. Alvin Kruger, John E. Wickstrom and H. M. Rivard.

Mr. Green, Chairman of the Educational Committee, announced that the next meeting would present Mr. Skribner in an educational lecture. President Cox asked the members to consider the problem of unpaid dues; Mr. S. Leitner made a motion that the treasury combine their efforts to complete a list of the members whose dues were unpaid and present the said list before the next regular meeting. Motion seconded and carried.

Bill was presented from the National Secretary of R.S.E.S. for 500 letter heads and envelopes which amounted to $7.09. Voted to be paid.

Certificates and cards were presented to J. P. Leitner and August Meier.

Meeting was turned over to the Educational Committee and the following questions were read from the Question Box:

1. Which is most efficient, a two-bladed fan or a four-bladed fan?
2. What is Xylene and is it any good?
3. What are the advantages or disadvantages of eccentrics over crank-shafts?
4. Why does an expansion valve only frost over?
5. What causes white powder-like substance to form over gauge of SO_2 job?
6. Where is the proper place to install a dryer, liquid or suction line?
7. How should a compressor that is stuck with moisture be cleaned out?

Meeting of March 24, 1936

Meeting was called to order by President Roy Cox and roll call of officers followed listing S. Leitner as absent. Roll call of members followed.

The minutes of the meeting of March 10th were read and approved. The treasurer's report by Mr. Ramey gave the balance in the treasury as $55.11.

A letter from the National Secretary of March 18th assuring the Kansas City Chapter that its first banquet would have a prominent place in the April issue was read to the chapter.

President Cox announced that if any member of the Society was looking for work to list his name with the secretary.

A postal card mimeograph machine purchased on approval for the amount of $11.00 was voted on and passed for purchase.

The following new members were voted on and accepted by the Kansas City chapter. John E. Wickstrom of Prier Brass Mfg. Co., M. M. Rivard and Keat Crockett as associate members; also Alvin W. Kruger as an active member.

The following visitors were called upon for remarks:

Mr. Stanley, Mr. Vanderheim, Mr. Macy and Mr. Donaldson all of the Donaldson Radio & Electric, also Mr. Tibbits of the Biggs Supply Co. and Mr. Renebold of the G. E. Company.

Mr. H. L. Green, chairman of the Educational Committee, presented Mr. Skribner who gave an interesting lecture on compressors and their capacities.

The meeting then adjourned after which beer and sandwiches were served.

Meeting of April 14, 1936

The meeting was called to order by President Roy Cox, and the minutes of the previous meeting were read and approved. Roll call of members and officers followed.

Mr. Cowen of the McNamara Company, who was the speaker of the evening, gave an interesting talk on water towers.

The meeting was closed with an open discussion on water towers.

ST. LOUIS CHAPTER

Meeting of March 26, 1936

By E. A. PLESSKOTT, *President*
2145 67th St., St. Louis, Mo.

THE regular meeting of the St. Louis Chapter R.S.E.S., held at the Crunden Library, March 26th, 1936, was called to order by President Plesskott at 8:15 P.M.

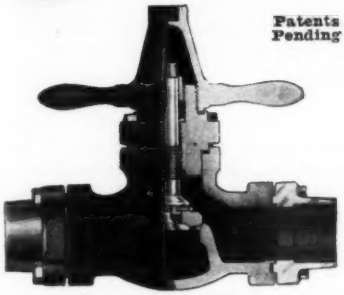
The meeting of March 12th, having been a trip through the Curtis Company factory, there were no minutes to read.

Mr. Plesskott explained that our hard working secretary found it necessary to go to Campbell, Missouri, in order to recuperate and be ready for the big refrigeration year ahead, and in his absence his work will be handled by Messrs. Plesskott and Vollman.

Mr. E. Roger Hewitt gave the second of what was to have been a series of talks on

Go to your JOBBER for these... HENRY PRODUCTS

He carries or can obtain the complete line of Henry Dryers, Strainers, Valves and Service Tools. No jobber with your interest at heart will ever substitute.

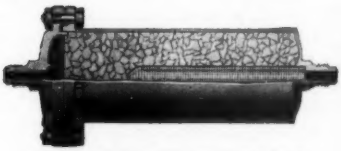


Patents Pending

WING CAP LINE VALVES

To 6-in. Special Freon Design

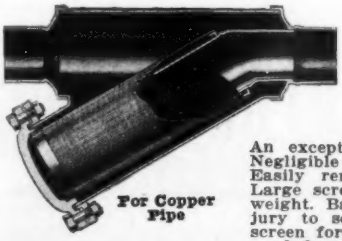
Has our patented, rotating, self-aligning, tapered brass stem disc. Resilient Freon packing. Valves can be repacked under pressure. Inverted wing cap operates valve. Tongue and groove, recessed-gasket joint under cap. Available with forged brass companion flanges, or with companion flanges and special adapters for soldering to copper pipe or welding to steel tubing, or with screw ends, or with inserted Streamline fittings.



FLANGED SHELL DEHYDRATOR

With Dispersion Tube

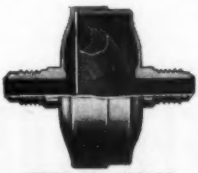
Copper-plated steel flange construction for convenience in refilling. Distortion-proof flange makes tongue and groove, recessed-gasket joint. Shell diameters: 2" and 2½". Dehydrant capacity: 13.5 cu. in. to 103 cu. in.



For Copper Pipe

TYPE 895 "Y" STRAINER

An exceptional design. Negligible pressure drop. Easily removable screen. Large screen area. Light weight. Baffle prevents injury to screen. 80 mesh screen for liquid line. 50 mesh for suction line.



TYPE 890 SMALL STRAINER

Hemispherical screen — 50% more area. This strainer has soldered copper shell with a reinforced screen.

HENRY VALVE COMPANY

1005-19 N. Spaulding Ave., CHICAGO, ILL.

THE MOST COMPLETE LINE IN THE INDUSTRY

"Air Conditioning," but before going into his subject begged to be relieved of any further talks, at least until near the end of this year.

Mr. Hewitt introduced Mr. J. J. Cytron, "Vocational Advisor" of the Refrigeration and Air Conditioning Institute, Inc., Chicago, who gave a brief resume of what his school had to offer in the way of proper training for the refrigeration industry.

Mr. Gygax gave an outline of the speaker for our next meeting.

A register was passed out by Mr. Plesskott with the request that all present sign it. It is his desire to get the semi-monthly mailing list down to the actual membership plus those showing a reasonable degree of interest and eliminate such members who never show up. After the chapter is built up and properly functioning, admission to non-members will be by invitation only.

Meeting of April 9, 1936

The regular meeting of the St. Louis Chapter R.S.E.S. held at the Crunden Branch Library, Thursday, April 9, 1936 was called to order at 8:30 P.M. by the president.

In the absence of Sec. Gray and Treasurer Vollman, Mr. Plesskott read the minutes of the previous meeting and there being no error or omission, they were approved as read.

Correspondence from national headquarters and also from our Acting-President, Mr. Jacobsen, was read and discussed. A letter from Mr. Gygax, our educational chairman, stating his inability to be with us this evening, and giving us the outline for our next meeting was also read.

The speaker of the evening, Mr. H. F. Williams of the Bussman Mfg. Co., was introduced by Mr. Plesskott. He presented a most interesting talk and demonstration of his company's newest products, "Fusetrons" and a motor protection device combining proper fusing and motor overload protection in one. This device is very soon to be marketed and should find a ready field among conscientious service men.

The proposed certificate examination was discussed briefly and a request made that all who intend to take it advise Mr. Plesskott as it is his intention to set an evening aside and not take up a regular meeting night for this purpose.

All were urgently requested to take care of this year's dues and make an effort to bring in new members, so that we may be assured of at least one of the prizes being offered by our National Headquarters.

CHICAGO CHAPTER

Meeting of April 28, 1936

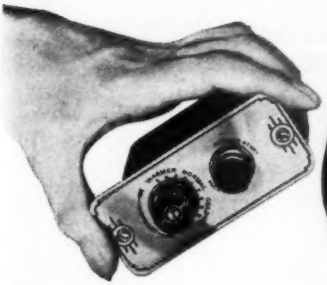
By **H. D. BUSBY**, *Secretary*
5611 Lawrence Ave., Chicago, Ill.

THE report from Mr. Herman Goldberg for the Entertainment Committee revealed the complete success of the recent Annual Banquet.

A motion was made by the Treasurer, duly seconded and carried, that any delinquent accounts of the chapter be paid at this time.

The meeting was then turned over to Mr. Hendrickson who called upon Mr. Hoffman of the Standard Refrigeration Parts Company, who gave a talk on "Field Service on Electric Motors."

REFRIGERATION · AIR CONDITIONING
PARTS · TOOLS · SUPPLIES
LARGEST STOCKS · WIDEST SELECTION · FASTEST SERVICE
Wholesale Only
OUR CATALOG PROTECTS YOU · SEND FOR IT NOW
H. CHANNON CO.
CHICAGO



CUTLER-HAMMER REFRIGERATION CONTROL

For Replacement Service

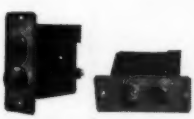
The dependable C-H Refrigerator Control is now available as a replacement unit. Same control used on popular-make Refrigerators . . . proved by time and service . . . manufactured by the Pioneer Control Company with 50 years of experience.

Easy to install, has the features which bring large-volume replacement business. Keep four models on hand and you are ready for 99% of all domestic calls. Each model mounts horizontally or vertically, fits large or small evaporator-shield openings. Simple connections get job done in a hurry.

NEW MODERN FEATURES. Differential adjustment screw gives whatever cut-in and cut-out temperatures or pressures are wanted; cold-control knob adjusts temperature or pressure range; defrost position; full overload protection to motor, resetting from self-indicating start-stop button. Handsome modern indicator plate in shiny chromium and black.

See your jobber at once. Send for complete new catalog describing this modern replacement control. Also replacement control for beverage coolers, ice cream cabinets and commercial service. Send for the catalog today. CUTLER-HAMMER, Inc., *Pioneer Manufacturers of Electric Control Apparatus*, 1363 St. Paul Avenue, Milwaukee, Wisconsin.

4 models meet 99% of all domestic calls. Temperature type in 24" and 48" tubes. Pressure type for sulphur dioxide and methyl chloride systems.



Mounts Horizontally or Vertically. Installs easily.

FOR BEVERAGE COOLERS AND ICE CREAM CABINETS

C-H Replacement Control for commercial use offers same big advantages as domestic controls. See catalog for full description.

CUTLER-HAMMER

REFRIGERATION CONTROL FOR REPLACEMENT SERVICE

SERVICE
plus + + +
"The compressor of my refrigerator is out of order . . . It is imperative it be fixed *immediately* . . . How long will it take? . . . How much will it cost?" Owners seemingly expect servicemen to *know all the answers* . . . Well, here's a tip worth remembering . . . It no longer is necessary for a repairman to take a lot of time getting in touch with several sources in order to get all the parts required to repair the compressor on any popular make of refrigerator.
Time can be saved, and customer satisfaction assured, by looking to the nearest PERFECTION jobber for *all* replacement parts and supplies . . . One order . . . One delivery . . . One bill . . . Less time spent "shopping," more time available to be sold as productive labor.
Many compressor parts, as well as other items, that have not previously been available for service needs through an independent source are now made by Perfection. These quality replacements are made of the finest materials, accurately machined and finished to insure easy installation, perfect fit and quiet operation.
If *SERVICE* plus appeals to you—we urge you to get in touch with the PERFECTION jobber nearest you.
PERFECTION REFRIGERATION PARTS CO.
(A division of Perfection Gear Co. Est. 1919)
HARVEY, ILLINOIS
PERFECTION Certified Replacement Parts for popular makes of refrigeration units
PERFECTION

Eleven ☆ Features

favor the selection of *Artic*

REG. U. S. PAT. OFF.

(DU PONT METHYL CHLORIDE)

THESE are the 11 best reasons why 35 leading manufacturers of domestic and commercial units are now using ARTIC for all or part of their lines. Each and every single feature contributes to the dependable performance which has been obtained from this refrigerant.

And now, after 16 years of satisfactory use, ARTIC is even more popular, for it meets the present-day requirements of the compact, lightweight, automatic units for household, commercial and air refrigeration.

For prompt delivery ARTIC is carried in standard containers at 53 authorized stocking points in 46 cities.

Complete technical and servicing information about ARTIC is available: For the engineer, designer or machine builder—"ARTIC, The Refrigerant" —a 56-page technical data book.

Service men will find the "ARTIC Service News" and the "ARTIC Service Manual" convenient sources of information about servicing, authorized distribution points, etc. Copies free on request.

The 11 Features of *Artic*

1. **Small volume displacement per unit of refrigeration, permitting the use of small, compact equipment.**
2. **Not corrosive to ordinary equipment.**
3. **Operates at positive pressures, even at sub-zero temperatures.**
4. **Fast cooling and quick freezing.**
5. **Gives controlled low temperatures easily and efficiently.**
6. **Thermally stable and does not decompose at any temperature existing in the refrigeration system.**
7. **Has low head pressures; adaptable to air-cooled condensers and light-weight equipment.**
8. **Economical of power.**
9. **Handled, serviced with ease.**
10. **Easy to "hold"—comparatively low leakage.**
11. **Easy to engineer—no unusual design problems.**

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The R. & H. Chemicals Department

E. I. DU PONT DE NEMOURS & CO., INC.

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District Sales Offices: Baltimore, Boston, Charlotte, Chicago, Cleveland, Kansas City, Newark, New York, Philadelphia, Pittsburgh, San Francisco

SAVE TIME

ON COMFORT COOLING AND REFRIGERATIO INSTALLATIONS

Standardize
ON
MINNEAPOLIS
HONEYWELL
CONTROLS FOR
Every Job

Combination Temperature and Humidity Control

Duct Temper Control

Modutrol Damper Motor

Refrigeration Pressure Control

WHEN you standardize on Minneapolis-Honeywell controls for refrigeration or air conditioning installations you benefit in many ways. First, you are using the finest controls available. Second, you have to stock only one line of controls. Third, you reduce installation and service costs because Minneapolis-Honeywell controls are easier to adjust and install. It will pay you to install Minneapolis-Honeywell controls on every job. Dependable controls cost less than service . . . Minneapolis-Honeywell Regulator Co., 2934 Fourth Avenue South, Minneapolis, Minnesota.

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Control Systems

BROWN INSTRUMENTS FOR
SATING, RECORDING AND CONTROLLING